324 Port InfiniBand FDR Switch Platform Hardware User Manual

PN:MSX6518-NR, MSX6518-6R

Rev 1.5

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Revision History

Table 1 - Revision History of this User's Manual

Revision	Date	Details
1.5	November 24, 2012	Added grounding post size and thread.Section 3.6.5 Changed height to 18U Added note regarding inserting Spines from the bottom up. Added Figure 32
1.4	October 24, 2012	Updated graphics Fixed height of the shelf from 1U to 1.5 U in Spec Sheet and on page 35
1.3	October 10, 2012	New power numbers Changed Part numbering Legend Fixed height of the shelf from 1U to 1.5 U
1.2	July 30, 2012	Fixed broken link.
1.1	July 05, 2012	Added EMI explanation to Appendix Added Figure showing 2nd type of mechanical lift. Added explanation to N+2 Power Numbers. Added instructions to use the socket wrench to tighten the upper bracket. Added notes and warnings.
1.0	February 2012	Initial release

About this Manual

This manual provides an overview of the SwitchX® based SX6518 modular InfiniBand chassis switch, and guidelines for its operation.

Intended Audience

This manual is intended for users and system administrators responsible for installing and setting up the chassis platform.

The manual assumes familiarity with the InfiniBand® architecture specification.

Related Documentation

The documentation set accompanying the QSFP Chassis InfiniBand Switch platform includes the following:

Table 2 - Reference Documents and Web Sites

Document Name	Description
InfiniBand Architecture Specification, Vol. 1, Release 1.2.1	The InfiniBand Architecture Specification that is provided by IBTA
Switch Hardware Errata	For any possible errata due to hardware issues see the switch support product page. This requires a customer support login.
Mellanox MLNX-OS™ SwitchX® Software WebUI User's Manual	WebUI Overview for MLNX-OS software.
Mellanox MLNX-OS™ SwitchX® Software User Manual	This document contains information regarding configuring and managing Mellanox Technologies' SwitchX® Switch Platforms.
MLNX-OS™ Software Command Reference Guide	Command Reference Guide for MLNX-OS listing all of the commands available through MLNX-OS with explanations and examples.
MLNX-OS™ Software Configuration Guide	Configuration Guide for MLNX-OS displaying different configuration scenarios.

Conventions

Throughout this manual, the name SX6518 and the terms chassis and switch are used to describe the 324 port QSFP InfiniBand chassis, unless explicitly indicated otherwise.

The following icons are used throughout this document to indicate information that is important to the user.

This symbol makes recommendations to the user.

This symbol indicates information that is helpful to the user.

This symbol indicates a situation that can potentially cause damage to hardware or software.

Warning! This symbol indicates a situation that can potentially cause personal injury and / or damage to hardware or software.

Mellanox Part Numbering Legend

Place	Field	Decoder
M		Mellanox Technologies
SX	System Type	SwitchX® Switch
PR	Data Transfer Protocol	(1, 2, 3, 4) = Ethernet (5, 6, 7, 8) = InfiniBand
G	Module Generation	5, 6, 7, 8
FF	Number of leafs	36, 18, 12, 06
-	Separator	
P	# Power Supplies	N = N+N redundant 0=0, 1=1, 2=2....
R	Chip Generation	R – SwitchX® S – SwitchX®-2

1 Overview

This User Manual provides an overview of the SX6518 QSFP Modular InfiniBand Switch Platform (known in this document as 'the chassis or switch') and its operational environment.

Mellanox SX6518 switch systems provide the highest performing fabric solution by delivering high bandwidth and low latency to Enterprise Data Centers (EDC), High-Performance Computing (HPC) and Embedded environments. Networks built with the SX6518 system can carry converged traffic with the combination of assured bandwidth and granular quality of service. Built with Mellanox's 5th generation SwitchX® VPI switch device, SX6518 systems provide up to 56Gb/s full bidirectional bandwidth per port. With up to 324 ports in a 18U high form factor, these systems are among the densest switching systems available.

The switch platform comes pre-installed with all necessary firmware for standard operation within an InfiniBand fabric and requires an InfiniBand compliant Subnet Manager running from one of the hosts or the management module of the switch system. An initial configuration procedure should be followed to initialize the switch before connecting it to the network after which normal operation can proceed. (See the installation guide for details regarding the initial configuration.) Once connected to the network, the Subnet Management software automatically discovers and configures the fabric and begins utilizing the switch.

The Mellanox Operating System (MLNX-OS™) software package provides a subnet manager and network management tools as well as connectivity software for servers and storage, and is available on the Mellanox web site.

Basic installation is covered in **Chapter 3, "Installation" on page 34**.

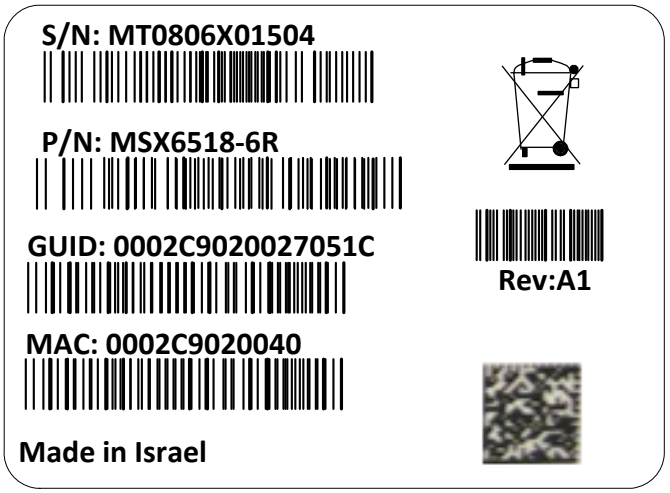
Hot-swapping components and hardware maintenance is covered in **Chapter 5, "Insertion and/or Hot swap Extraction" on page 65**.

1.1 Product Information

1.1.1 Serial Number and Product Version Information

The serial number, GUID Identifier and product version information are found on the label that is attached to the pull-out tab that is below the Mellanox logo on the spine side of the chassis.

Figure 1: Generic Product Label



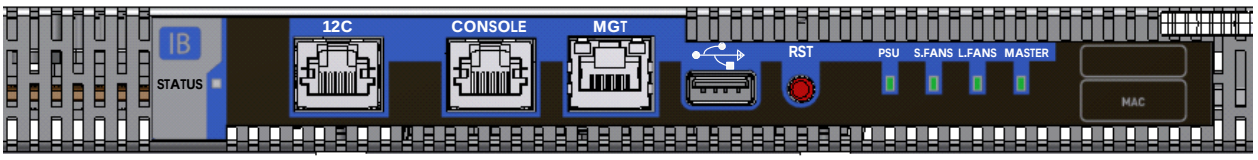
The GUID is the System Image GUID according to the IB spec. It is burned on the board which is in the chassis. All the boards and the management software look for this GUID in addition to their own Node GUID.

Figure 2: Product Label Tab Location

1.1.2 Management Module MAC

Each management module has a label with its MAC address. See below for the location of this label.

Figure 3: Management Module MAC Address Location



MAC address location

1.1.3 Product Physical Specifications and Power

Table 3 - Switch Rack Mechanical and Environmental Requirements

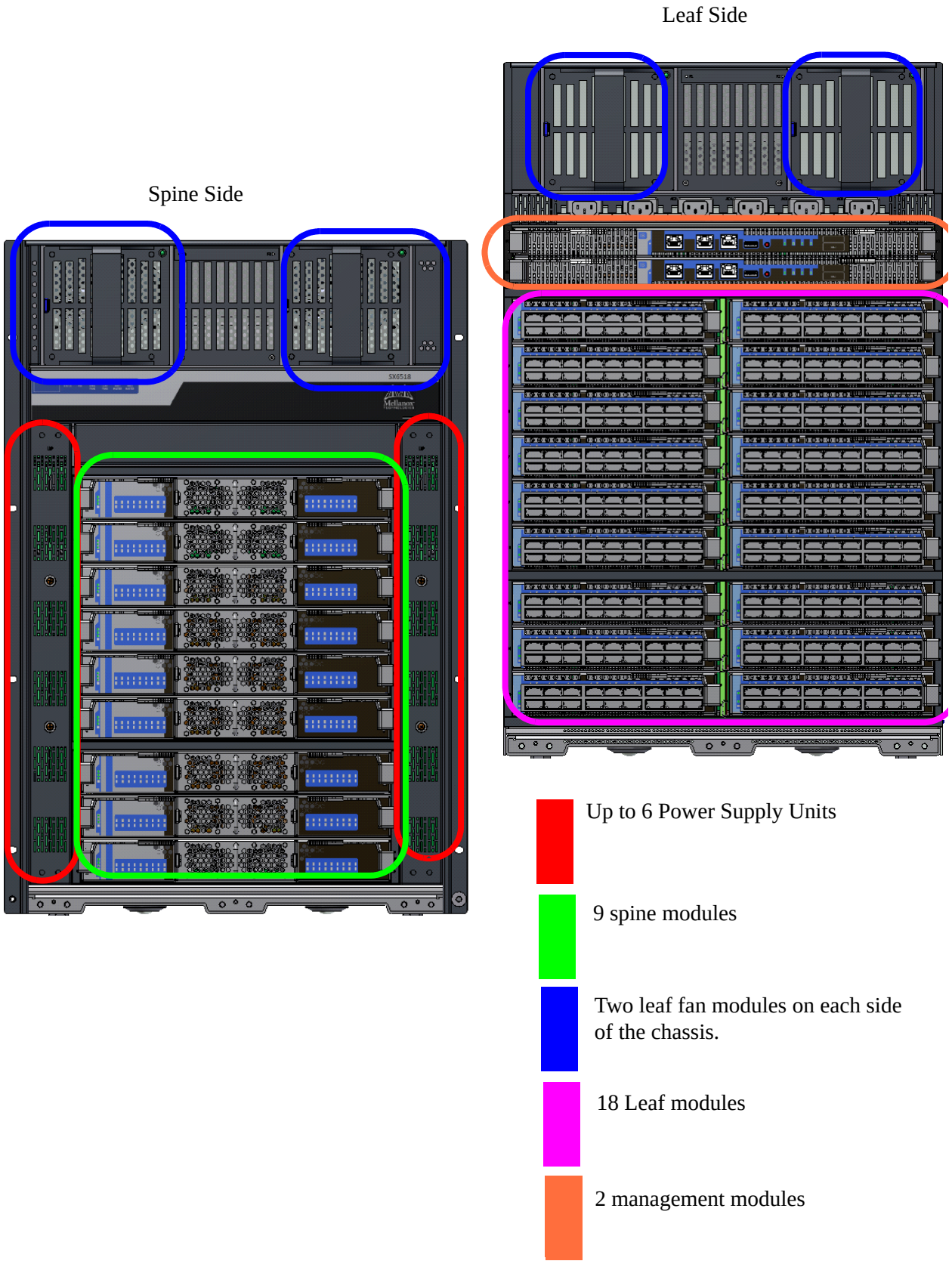
Rack Height Required	Rack Width	Rack Depth	# of leafs / # of Spines	Weight	Max. Power (324 x QSFP Ports)	Ambient Temp.
18U (755 mm) 16U for the chassis and 2U for the shelf	19” (EIA-310) (482.6 mm)	25.7” 685 mm	18/9	212.36 kg (468 LBS) Full configuration 90 kg (199 LBS) Empty configuration 112 kg (247 LBS) Shipped configura-tion	4897W (including QSFP active cables at 2W) 3911W (passive cables) Up to 6 Power Supplies of 100-240VAC, 50-60Hz, 6.3-13A	Max: 45ºC Min: 10ºC

The switch ships in a minimum base configuration plus additional modules depending on the chosen customer configuration. Optional modules included:

- Leaf boards
- Management modules
- Spine boards

Figure 4 shows the connector and spine sides fully populated.

Figure 4: SX6518 Switch Views


Leaf Side
Spine Side
Up to 6 Power Supply Units
9 spine modules
Two leaf fan modules on each side of the chassis.
18 Leaf modules
2 management modules

1.2 Features List

- 324 FDR (56Gb/s) InfiniBand ports in a 16U switch
- 36.36 Tb/s aggregate data switching capacity with ultra low latency
- IBTA 1.3 and 1.21 compliant
- SDR/DDR/QDR/FDR10/FDR link speed
- Congestion control [1]
- Adaptive routing[1]
- Port mirroring[1]
- Chassis High Availability
- sMB High Availability

1.3 InfiniBand FDR and FDR10 Overview

The Mellanox SX6518 switch system supports FDR, a pre-standard InfiniBand data rate, where each lane of a 4X port runs a bit rate of 14.0625Gb/s with a 64b/66b encoding, resulting in an effective bandwidth of 54.54Gb/s. The FDR physical layer is an IBTA specified physical layer using different block types, deskew mechanism and framing rules.

The SX6518 switch also supports FDR10, a non-standard InfiniBand data rate, where each lane of a 4X port runs a bit rate of 10.3125Gb/s with a 64b/66b encoding, resulting in an effective bandwidth of 40Gb/s.

FDR10 supports 20% more bandwidth over regular QDR using the same QSFP cables/connectors.

Both FDR and FDR10 support Forward Error Correction (FEC), as described in IEEE Std 802.3ap™-2007 (Amendment to IEEE Std 802.3™-2005) chapter 74.

FDR and FDR10 are only guaranteed to work with approved Mellanox Cables.

FDR10 is only guaranteed to work with approved Mellanox ConnectX-3 adapters.

1. Features for a future release.

2 Hardware

2.1 Installation Safety Warnings

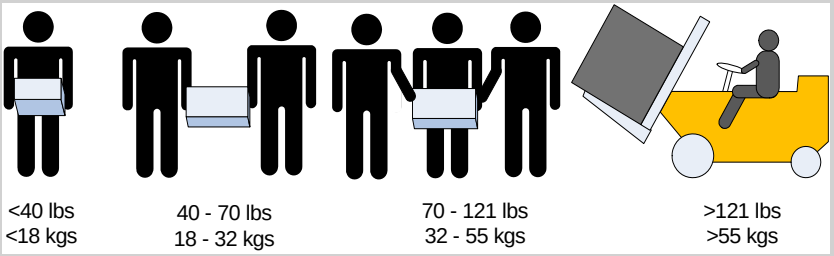
These safety warnings are in English. For French, Spanish, and German see the Appendixes.

1. **Installation Instructions**

Read all installation instructions before connecting the equipment to the power source.

2. **Bodily Injury Due to Weight**

Use enough people to safely lift this product.



3. **Installation in Restricted Access Location.**

This unit is intended for installation in a Restricted Access Location.

4. **Over-temperature**

This equipment should not be operated in an area with an ambient temperature exceeding the maximum recommended: 45°C (113°F). Moreover, to guarantee proper air flow, allow at least 8cm (3 inches) of clearance around the ventilation openings.

5. **Stacking the Chassis**

The chassis should not be stacked on any other equipment. If the chassis falls, it can cause bodily injury and equipment damage.

6. **Redundant Power Supply Connection - Electrical Hazard**

This product includes a redundant power or a blank in its place. In case of a blank power supply, do not operate the product with the blank cover removed or not securely fastened.

7. Multiple Power Inlets

Risk of electric shock and energy hazard.
The PSUs are all independent.
Disconnect all power supplies to ensure a powered down state inside of the switch platform.

8. During Lightning - Electrical Hazard

During periods of lightning activity, do not work on the equipment or connect or disconnect cables.

9. Copper InfiniBand Cable Connecting/Disconnecting

Copper InfiniBand cables are heavy and not flexible, as such they should be carefully attached to or detached from the connectors. Refer to the cable manufacturer for special warnings/instructions.

10. Rack Mounting and Servicing

When this product is mounted or serviced in a rack, special precautions must be taken to ensure that the system remains stable. In general you should fill the rack with equipment starting from the bottom to the top.

11. Equipment Installation

This equipment should be installed, replaced, and/or serviced only by trained and qualified personnel.

12. Proper Enclosure

A suitable electrical, mechanical and fire enclosure shall be provided by the end product manufacturer and or the end user.

13. Equipment Disposal

Disposal of this equipment should be in accordance to all national laws and regulations.

14. Local and National Electrical Codes

This equipment should be installed in compliance with local and national electrical codes.

15. UL Listed and CSA Certified Power Supply Cord Leakage >3.5mA

For North American power connection, select a power supply cord that is UL Listed and CSA Certified, 3 - conductor, [16 AWG], terminated with a molded plug rated at 125 V, [13 A], with a minimum length of 1.5m [six feet] but no longer than 4.5m.

For European connection, select a power supply cord that is internationally harmonized and marked "<HAR>", 3 - conductor, minimum 1.0 mm^2 wire, rated at 300 V, with a PVC insulated jacket. The cord must have a molded plug rated at 250 V, 10 A.

16. High Leakage Current

Warning: High leakage current; Earth connection essential before connecting supply.

17. Add GND connection information

Before connecting this device to the power line, the protective earth terminal screws of this device must be connected to the protective earth in the building installation.

(GND Connection Information):

The building installation shall provide a means for a connection to protective earth; and the equipment shall be permanently connected to that by a service person.

A SERVICE PERSON shall check whether or not the socket - outlet from which the equipment is to be powered provides a connection to the building protective earth. If not, the SERVICE PERSON shall arrange for the installation of a PROTECTIVE EARTHING CONDUCTOR from the separate protective earthing terminal to the protective earth wire in the building. The equipment shall be installed in area where equipotential bonding exists ((such as a telecommunication centre or a dedicated computer room).

18. Installation codes

This device must be installed according to the latest version of the country national electrical codes. For North America, equipment must be installed in accordance to the applicable requirements in the US National Electrical Code and the Canadian Electrical Code.

19. Interconnection of units

Cables for connecting to the unit RS232 and Ethernet Interfaces must be UL certified type DP-1 or DP-2. (Note- when residing in non LPS circuit)

Overcurrent Protection: A readily accessible Listed branch circuit overcurrent protective device rated 20 A must be incorporated in the building wiring.

20. Hazardous Radiation Exposure

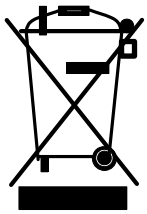
Caution – Use of controls or adjustment or performance of procedures other than those specified herein may result in hazardous radiation exposure.

CLASS 1 LASER PRODUCT and reference to the most recent laser standards:
IEC 60825-1:2007/03 and EN 60825-1:2007

21. Do Not Use the Switch as a Shelf or Work Space

Caution: Slide/rail mounted equipment is not to be used as a shelf or a work space.

22. WEEE Directive



According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and not disposed of with regular household waste.

Dispose of this product and all of its parts in a responsible and environmentally friendly way.

23. Country of Norway Power Restrictions

This unit is intended for connection to a TN power system and an IT power system of Norway only.

2.2 Power Supply Redundancy

The MSX6518 platform comes standard with six power supplies and has two order options:

- MSX6518-6R - N+1 1000W output per PSU
- MSX6518-NR - N+N 1600W output per PSU

2.2.1 1000W Power Supply Units

The 1000 W power supplies deliver 1000W at 48V. The input to each of these power supplies requires 1214.46W at 220V in order to output 1000W.

With 1000W PSUs the only redundancy option is N+2. In this configuration 2 PSUs (Power Supply Unit) can be extracted without bringing down the system. When using the 1000W PSUs, the minimum complement of power supply units is 6 and the chassis will continue to run at full capacity with only 4 PSUs.

2.2.2 1600W Power Supply Units

When using the 1600W PSUs, the minimum complement of power supply units is 3 and the chassis will continue to run at full capacity with only 3 PSUs.

The 1600W PSUs can implement two redundancy options.

- N+1 configuration

  The chassis when supplied by a single power grid can be configured for N+1 times 3. This means that all PSUs are supplied from a single power source usually the commercial electric grid. This enables 3 power supply redundancy.

- N+N configuration

  N+N with 1600W PSUs will allow for N+N redundancy. This requires a second power grid supplied by a

  - backup power supply grid
  - generator
  - battery backup system
  - any combination of the above

  Connecting 3 power supplies to one power supply grid and the remaining 3 power supplies to a secondary power supply grid will create N+N redundancy. This is High Availability. Under these conditions should a power supply fail (an electric company power failure or blackout for example) power grid High Availability will continue to keep the chassis running at full capacity through the secondary or backup power supply grid.

With N+N optional PSU grid redundancy the chassis can run on 1/2 of the full complement of PSUs. N+N allows the chassis to run on 3 PSUs supplied from one power grid while 3 are connected to a second power grid.

With power grid A charged with current and power grid B not charged there is only grid redundancy and not PSU redundancy.

MLNX-OS™ may power down some leafs. If this happens it may be necessary to reboot the chassis once the defective PSU has been replaced. Two simple ways to reboot is to use the reboot command in the CLI or reboot through the Web GUI.

The form is identical between the 1600W and the 1000W PSUs. The standard PSU weighs 0.3kg more than the 1600W PSU.

N+N redundancy ONLY works with a supply voltage of 220V.

Table 4 - OPNs for Power Supply Units

OPN	PSU Wattage	Description
MTP005001	1000 W	Supplies N+2 redundancy for SX6536 and SX6518 chassis Supplies N+1 redundancy for SX6512 and SX6506 chassis
MTP006002	1600 W	Supplies N+N redundancy for all switch chassis at 220 Volts

2.3 LED Status Indicators

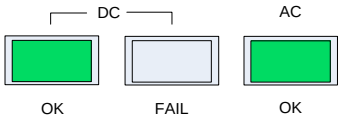
The LEDs are placed on the chassis for the convenience of the IT manager. All chassis conditions and management options are available and controllable through the management SW, either CLI or Web GUI.

It is recommended that all of the chassis sub systems be maintained and managed through the management software.

2.3.1 Power Supply Unit LEDs

Each Power Supply Unit has the following indicator LEDs.

Figure 5: Power Supply Unit Status Indications



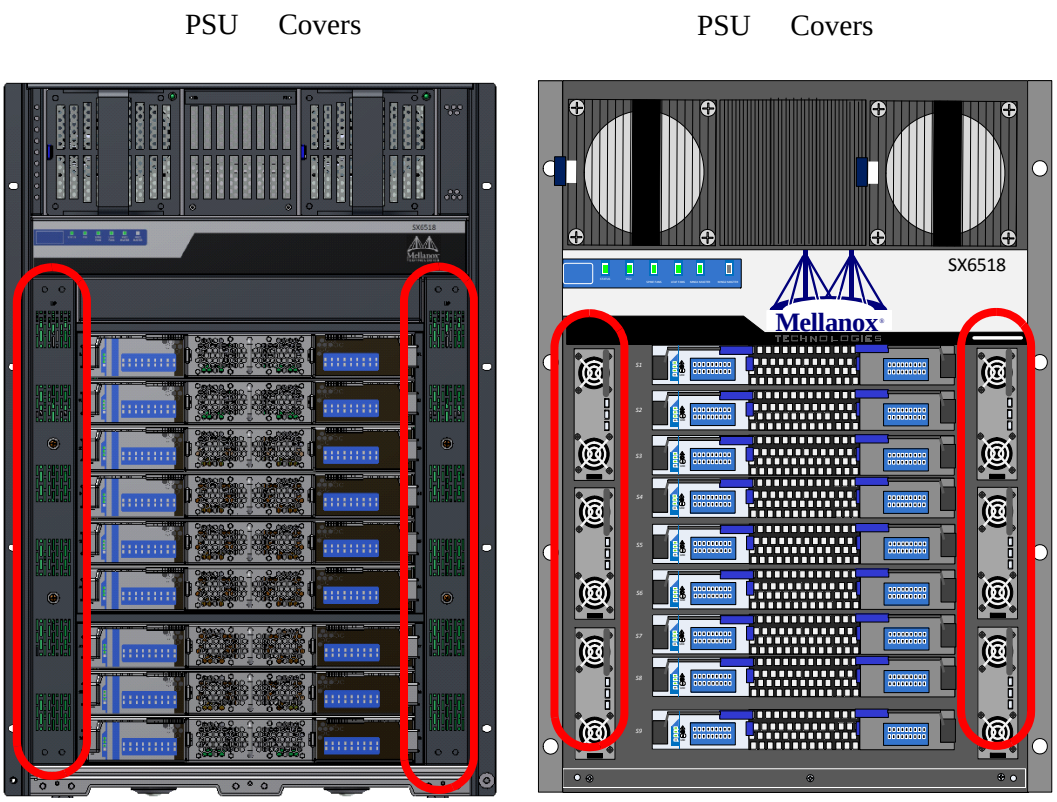
AC – When lit this LED indicates input voltage between 100 and 240 Volts.

DC FAIL – When lit this LED indicates a fault in the power supply.

DC OK – When lit this LED indicates that the output from the power supply is +48 VDC.

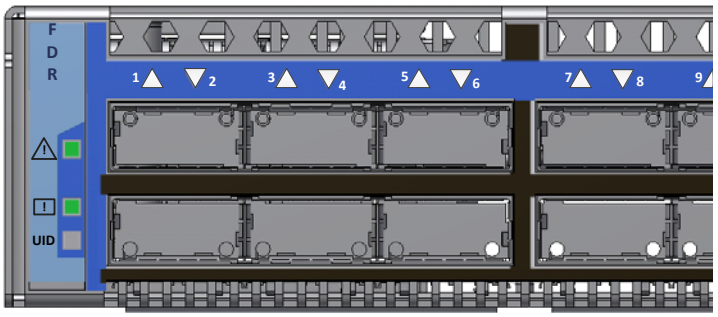
The PSUs are on the spine side of the chassis behind two cover panels. The plugs for these PSUs are on the leaf side of the chassis.

Figure 6: PSU Cover On and Off



2.3.2 Leaf Board LED Indicators

Figure 7: Leaf Board Led Indicators



2.3.2.1 Status LED

Each leaf board has a Status LED on the far left of the leaf. Table 5 shows the leaf status according to the LED condition.

The Leaf Status indicator LED has the following LED assignment:

Table 5 - Leaf Status LED

LED Condition	LED Description
Off	No power to the Leaf
Solid Green	Leaf is up and running
Flashing Green	Leaf is powering up
Solid Orange	Non fatal error – this leaf needs troubleshooting, but does not require chassis shutdown
Solid Red	Fatal error

2.3.2.2 Bad Port LED

The Bad Port indicator is located on the left side of the leaf. The following Bad Port conditions are possible:

Table 6 - Bad Port LED Configurations

LED Configuration	Description
Off	OK – all ports are up and running.
Flashing Orange	Error – one or possibly more ports has just received a symbol error

This LED shows symbol errors. Possible causes for this are:

- bad cable
- bad connection
- bad connector

This LED lights up when one or more ports is receiving a symbol error. The LED immediately goes off until the next symbol error is received.

2.3.2.3 UID LED Switch Identifier

The UID LED is a debug feature that will become available to customers in the near future. For details please contact Mellanox Technologies support.

2.3.2.4 Leaf Board Port Connector LED Assignment

Above the ports are two LEDs one for the upper port ▲ and one for the lower port ▼. Each port has a single 2 color LED. Table 7 shows the link status according to the LED condition.

Table 7 - Connector Physical and Logical Link Indications

LED Condition	LED Description
Off	No power to the port
Solid Green	Logical link up

Table 7 - Connector Physical and Logical Link Indications

LED Condition	LED Description
Flashing Green	Data activity – flashing speed is proportional to data transfer speed
Solid Orange	Physical link up
Flashing Orange	A problem with the physical link

The LED indicator, corresponding to each data port, will light orange when the physical connection is established (that is, when the unit is powered on and a cable is plugged into the port with the other end of the connector plugged into a functioning port). When a logical connection is made the LED will change to green. When data is being transferred the light will blink green.

The switch does not provide a visual means to indicate the port speed configuration (SDR, DDR, QDR, or FDR) and/or the link width (1X or 4X). The speed and link width configurations can be retrieved using management software.

2.3.3 Spine Board LED Indicators

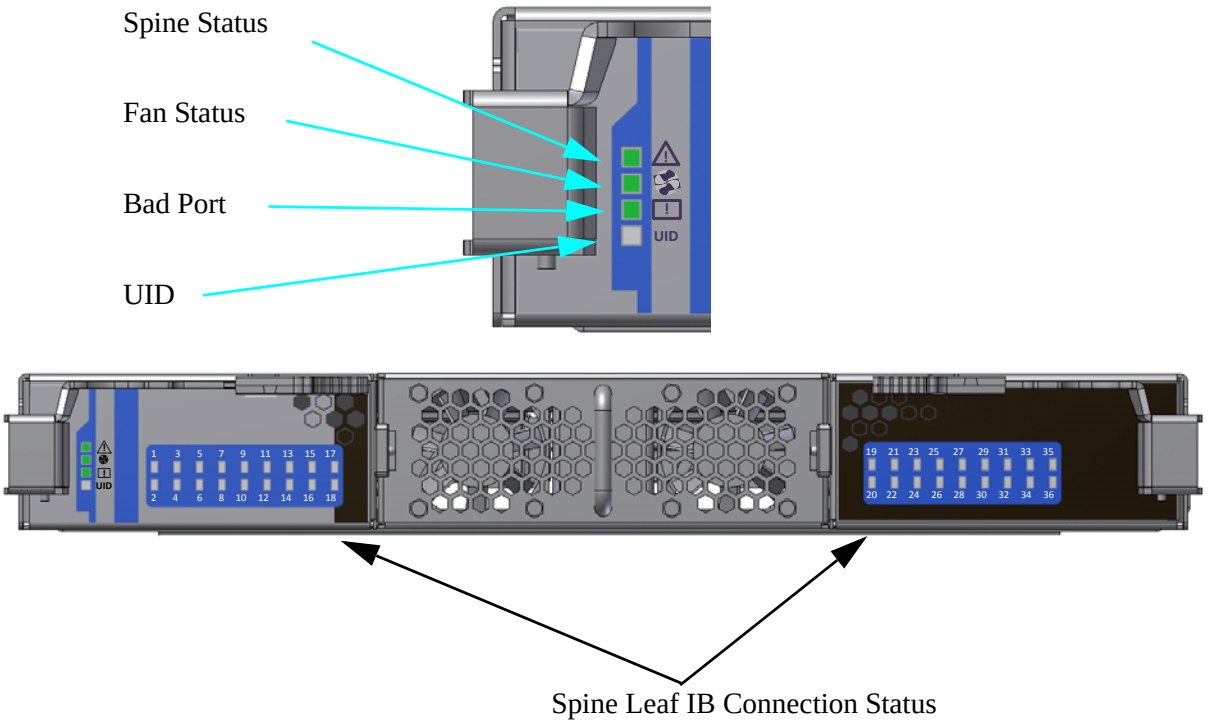
Each leaf board is connected by links to each spine module. Each spine has the following LEDs.

- One status LED for the spine health
- One status LED for the spine fan modules
- 36 status LEDs showing the existence of the leaf to spine connection
- One Bad Port Led showing symbol errors in the data stream
- One UID LED that can be lit to identify an individual spine

The 36 LEDs on each spine are divided by the number of leafs and the result (N) is the number of connections from each leaf that are connected to the spine. 9 spines must be installed and working to ensure that full BW exists between nodes. The maximum number of connections from each leaf is 2. If the (number of leafs) x (the maximum number of connections per leaf) is less than 36 then some of the leaf to spine connection LEDs may be OFF.

The status LEDs for the spine and their descriptions are shown in Table 8. The LEDs indicate as follows.

Figure 8: Spine Status LEDs



2.3.3.1 Status LED

Table 8 shows the spine status according to the LED condition.

Table 8 - Spine Status LED

LED Condition	LED Description
Off	No power to the spine
Solid Green	Spine is up and running
Flashing Green	Spine is powering up
Solid Orange	Non fatal error – this spine needs troubleshooting, but does not require chassis shutdown
Solid Red	Fatal error

2.3.3.2 Fan LED

The spine fan indicator LED has the following LED assignment:

Table 9 - Spine Fan Status LED

LED Color	LED Description
Solid Green	Spine Fan is OK
Solid Yellow	One or more of the fans in this spine is not working Each spine has two fans in the fan module

2.3.3.3 Spine to Leaf IB Connection Status LEDs

The leaf connection status on each spine displays the condition of the connection between the spine and each leaf. There is a minimum of one LED per leaf per spine and a maximum of 2 LEDs per leaf. These LEDs indicate a valid connection between a leaf and a spine.

Table 10 shows the leaf to spine status according to the LED condition.

Table 10 - Spine to Leaf IB Link Status

LED Condition	LED Description
Off	Link is down
Solid Green	Logical connection
Flashing Green	Data activity
Solid Orange	Physical connection

2.3.3.4 Bad Port LED

The Bad Port indicator is located on the left side of the spine. The following Bad Port conditions are possible:

Table 11 - Bad Port LED Configurations

LED Condition	Description
Off	OK – No ports have received symbol errors recently
Flashing Orange	Error – One or possibly more ports has just received a symbol error.

This LED shows symbol errors. Possible causes for this are:

- bad cable
- bad connection
- bad connector

This LED lights up when one or more ports is receiving a symbol error. The LED immediately goes off until the next symbol error is received.

2.3.3.5 UID LED Switch Identifier

The UID LED is a debug feature that will become available to customers in the near future. For details please contact Mellanox Technologies support.

2.3.4 Spine Side Panel Display LED Indicators

The spine side panel display has LEDs that show the chassis condition.

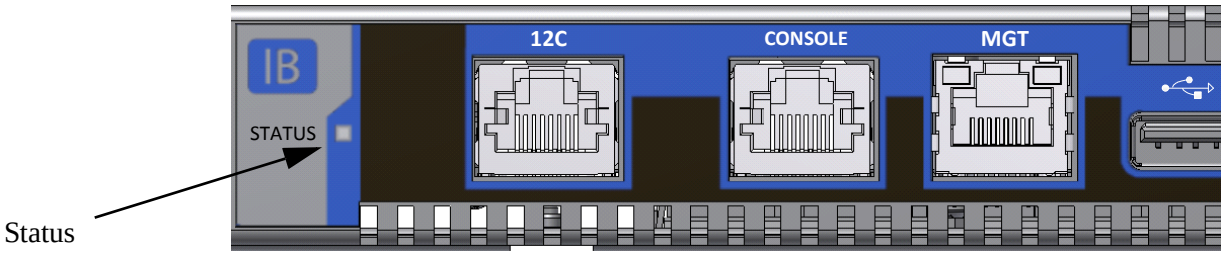
Figure 9: Spine Side Panel Display Status Indications

Table 12 - LEDs Display for Normal Operation

LED Condition	Description	Normal State
STATUS	Off – No Power Green – System is up and running Yellow – System warning. Attention needed (such as overheating) Red – System not operational (Diagnostics fail, CPU hang, HW fail, Overheat-critical) Blinking green – System booting / Restore factory defaults in progress	Green
PSU STATUS	Off – No power Green –Normal operational Red – PS fault detected. User should check individual power supplies for fault indications.	Green
SPINE FANS STATUS	Off – No power to fan Green – Nominal operational Red – One or more of the spine fans is bad. User should check individual spine fan LEDs for fault indications.	Green
LEAF FANS STATUS	Off – No power to fan Green – Nominal operational Red – One or more of the leaf fans is bad. User should check individual leaf fan LEDs for fault indications.	Green
MNG1 MASTER STATUS	Off – - no power - this management module is not installed - this management module is not the master Green – Management module is operating as a master	Green
MNG2 MASTER STATUS	Off – - no power - this management module is not installed - this management module is not the master Green – Management module is operating as a master	Off

2.3.5 Management Module LED Indicators

Figure 10: Management Module Status Indications



The management module LEDs display the switch system operating conditions.

Table 13 - LEDs Display for Normal Operation

LED Condition	Description	Normal State
STATUS This LED shows the status of the chassis.	Off – No Power Green – System is up and running. Yellow – System warning. Attention needed (such as overheating). Red – System not operational (Diagnostics fail, CPU hang, HW fail, Overheat-critical) Blinking green – System booting / Restore factory defaults in progress.	Green
PSU STATUS	Off – No power Green – Normal operational Red – PS fault detected. User should check individual power supplies for fault indications.	Green
SPINE FANS STATUS	Off – No power to fan Green – Nominal operational Red – One or more of the spine fans is bad. User should check individual spine fan LEDs for fault indications	Green
LEAF FANS STATUS	Off – No power to fan Green – Nominal operational Red – One or more of the leaf fans is bad. User should check individual leaf fan LEDs for fault indications	Green
MASTER	Off – this management module is not the master MM Green – Management module is operating as a master (i.e., the other management module is a slave)	Green

2.3.6 Port Connector Interfaces

The connector side of the switch has 18 leaf boards and each leaf board has 18 QSFP ports. The ports on each leaf board are placed in two rows, 9 ports to a row. The ports are labelled as shown in Figure 11. The bottom row ports are flipped from the top row. See Figure 12.

Figure 11: Port Numbering

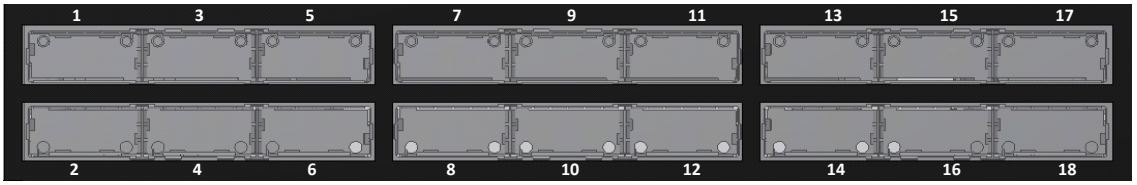
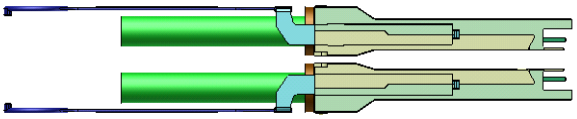


Figure 12: Top and Bottom Ports



2.4 Air Flow

These switches come with the air flow pattern of air entering through the spine side and exiting through the connector side.

2.5 QSFP Cable Power Budget Classification

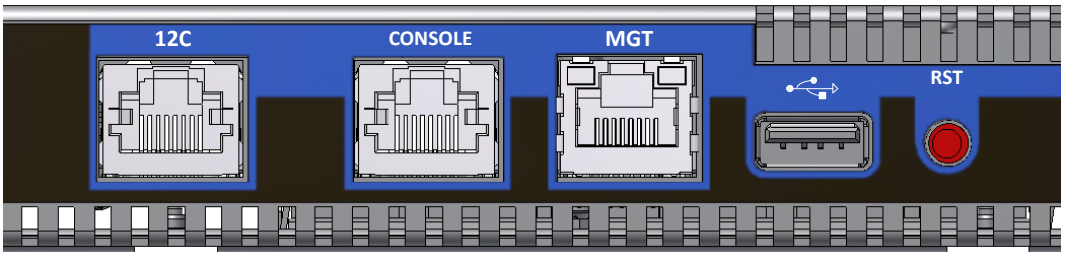
All SX6518 QSFP switches are designed for active cables with a max power per module of 2.0W. This is power level 2 according to the QSFP Public Specification.

2.6 Management Module Interfaces

The switch system requires at least one management module. The management module has five interfaces to connect to the SX6518. They are:

- 1 I2C port
- 1 CONSOLE port – this is an RS232 connector for connecting to a host machine
- 1 MGT – this is an Ethernet connector
- 1 USB port
- 1 RST – reset button

Figure 13: Management Module Interfaces



2.6.1 I2C

This interface is for Debug and Troubleshooting only.This interface is for FAEs only.

2.6.2 CONSOLE

The CONSOLE port is used during the installation process to configure the chassis for remote management. Connect this port to a local host using the harness supplied with the chassis. See the Installation Guide for the initial configuration procedure.

2.6.3 MGT– Management

The MGT port is an Ethernet port for remote management. Any remote terminal connected to the Ethernet port can then be used to manage the fabric and chassis.

Each Ethernet connector gets connected to Ethernet switches. These switches must be configured to 100M/1G auto-negotiation.

Initial configuration must be done on all of the management modules. The first management module you configure will be the master.

2.6.4 USB

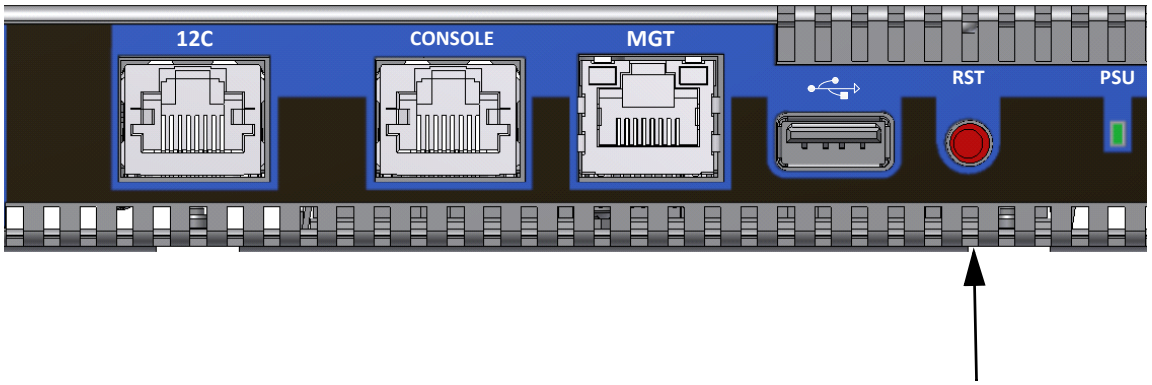
The USB port can be used to upload new SW using any storage device that has a USB connector. This interface is USB 2.0.

2.6.5 Reset – RST

The Reset button resets the chassis management module when the button is pushed. When the button is held down for 15 seconds the management module is reset and the password deleted.

DO NOT use a sharp pointed object such as needle or push pin for pressing the Reset button. Sharp objects can cause damage, use a flat object such as a paper clip.

Figure 14: Reset Button



This button resets the CPU of the management module. A quick push of this button performs this reset. When the reset button is pushed on the master management module this management module is reset becoming the slave and the other management module becomes the master. If there is only one management module in the chassis all of the leafs and ports are reset by bringing them down and powering them up when the reset button is pushed. When the button is held down for 15 seconds the management module is reset and the password is deleted. You will then be able to enter without a password and make a new password for the user “admin”.

3 Installation

This chassis can be installed in standard 19” racks that have depths between 65cm and 80cm between the vertical supports of the rack.

Installation and initialization of the chassis is a simple process requiring attention to the normal mechanical, power, and thermal precautions for rack-mounted equipment. Your chassis comes only with the power supplies and fans pre-installed. The rest of the openings are populated with blanks. All of the leafs, spines, and management modules come shipped in a separate package.

The chassis requires initial configuration to get the chassis and Fabric management up and running through remote management. See the Installation Guide that is packed in the box for the instructions to make the initial configuration.

This unit is intended for installation in a Restricted Access Location. A restricted access area can be accessed only through the use of a special tool, lock and key, or other means of security.

3.1 Environmental and Safety Recommendations

The following are Mellanox recommendations.

Recommended ambient temperature in the System room is $20^{o} \pm 5^{o}$ C.
Recommended humidity range is 40% ± 15% without condensing.

It is highly recommended that the installation sites be as isolated as possible from all sources of radio transmissions and electrical interference.

It is highly recommended that the installation site building be equipped with a lightning rod.

It is highly recommended that the installation site be equipped with smoke detectors and a fire alarm warning system.

The system requires a KVA rated UPS system. It is recommended that a UPS system be installed to protect the equipment in the event of unexpected power failure.

Make sure that the outlets and circuits will not be overloaded. Spread out the load over at least two or three circuits or use a 3 phase circuit.

3.2 Chassis Package Contents

The package includes:

- 1 chassis with the following modules installed:
  - 4 fans
  - 6 PSUs
- 1 Installation Guide
- 1 chassis
- 1 box containing various other parts
- 1 installation kit box
- 1 box containing 6 power cords 250v 15a 2.0M, C14 to C13, USA UL Standard
- 1 cable management kit

Before you install your new SX6518 series chassis, unpack the system and check to make sure that all the parts have been sent, check this against the parts list. Check the parts for visible damage that may have occurred during shipping.

If anything is damaged or missing, contact your customer representative immediately.

The rack mounting holes conform to the EIA-310 standard for 19-inch racks. Guarantee proper ventilation, by leaving 8cm (3”) of space to the front and rear of the switch. This will ensure proper air flow through the chassis. This is crucial for maintaining good airflow at ambient temperature. In particular, route cables such that they do not impede the air into or out of the chassis.

3.3 Leaf Package Contents

The leafs are ordered by the customer and are shipped 4 to a box. The customer will receive as many boxes as needed to fill the order.

3.4 Spine Package Contents

The spines are shipped 3 to a box. The customer will receive as many boxes as needed to fill the chassis with a full complement of spines.

Insert the bottom spine board first.

3.5 Management Package Contents

The package includes:

- all of the management modules ordered by the customer
- 1 RJ45 to DB9 harness for each management module received

3.6 Physical Installation

Warning: This equipment is very heavy. Safety is the first concern. Make sure that adequate manpower and proper equipment is used for transporting and moving the chassis.

The fully loaded chassis weighs:

212.36 kg (468 LBS) full configuration

90 kg (199 LBS) empty configuration

112 kg (247 LBS) shipped configuration

The switch platform uses 18U of rack pace in a standard 19” rack, 16U for the chassis and 2U for the shelf. The switch ships from the factory with mounting holes on the spine side. There are upper brackets to connect the leaf side to the rack near the top of the chassis, and there are two lock-down bars to secure the chassis to the shelf. The weight of the switch is supported from underneath the unit by the shelf.

This chassis can be installed in standard 19” racks that have between 65cm and 80cm between the vertical supports of the rack. Make sure that a fully populated rack including cables will have sufficient air flow for cooling.

Choose a rack which is able to support the mechanical and environmental characteristics of a fully populated switch chassis.

3.6.1 Starting with the Rack

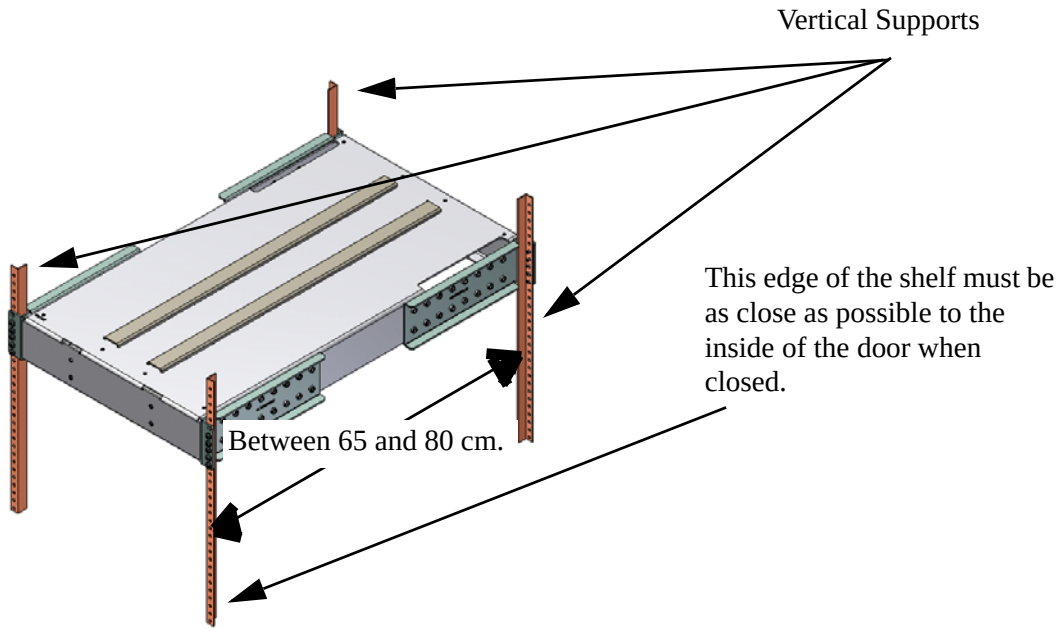
3.6.1.1 Rack Recommendation

Due to the space required by up to 324 connector cables Mellanox recommends a rack that is 100 cm long and 80cm wide. This will allow for proper cable management and enough ventilation to properly cool the chassis.

3.6.1.2 Preparing the Rack

The rack may need to be modified to accommodate the SX6518 chassis. The distance between the vertical supports must be between 65 and 80 cm.

Figure 15: Distance Between the Vertical Supports


Vertical Supports
This edge of the shelf must be as close as possible to the inside of the door when closed.
Between 65 and 80 cm.

3.6.2 ESD Connection

Before starting any procedure on the SX6518 switch system:

1. Put an ESD prevention wrist strap on your wrist, and make sure there is good contact between your body and the strap.
2. Plug the other end of the wrist strap to a valid ground. Make sure that this is a tight fit.

3.6.3 Installation Procedure

Installing the chassis will be a lot easier if you can remove the sides of the rack.

You will need a fork lift, to move and insert the chassis into the rack.

3.6.3.1 Requirements

You will need:

- #2 phillips screwdriver
- a fork lift
- measuring tape
- #3 phillips screwdriver
- a grounding lug
- ground wire of sufficient length and gauge to properly ground the chassis

The installation will be much easier with a power screwdriver.

It is recommended to use AWG6 or 4mm diameter wire for grounding purposes.

It is recommended to have at least two people for the duration of the installation procedure. Use a mechanical lift to raise this chassis. If not, use enough manpower to ensure the safety and wellbeing of all of the people involved in the installation.

3.6.3.2 Installation and Cable Management Kit Parts

- Parts included in the installation kit:

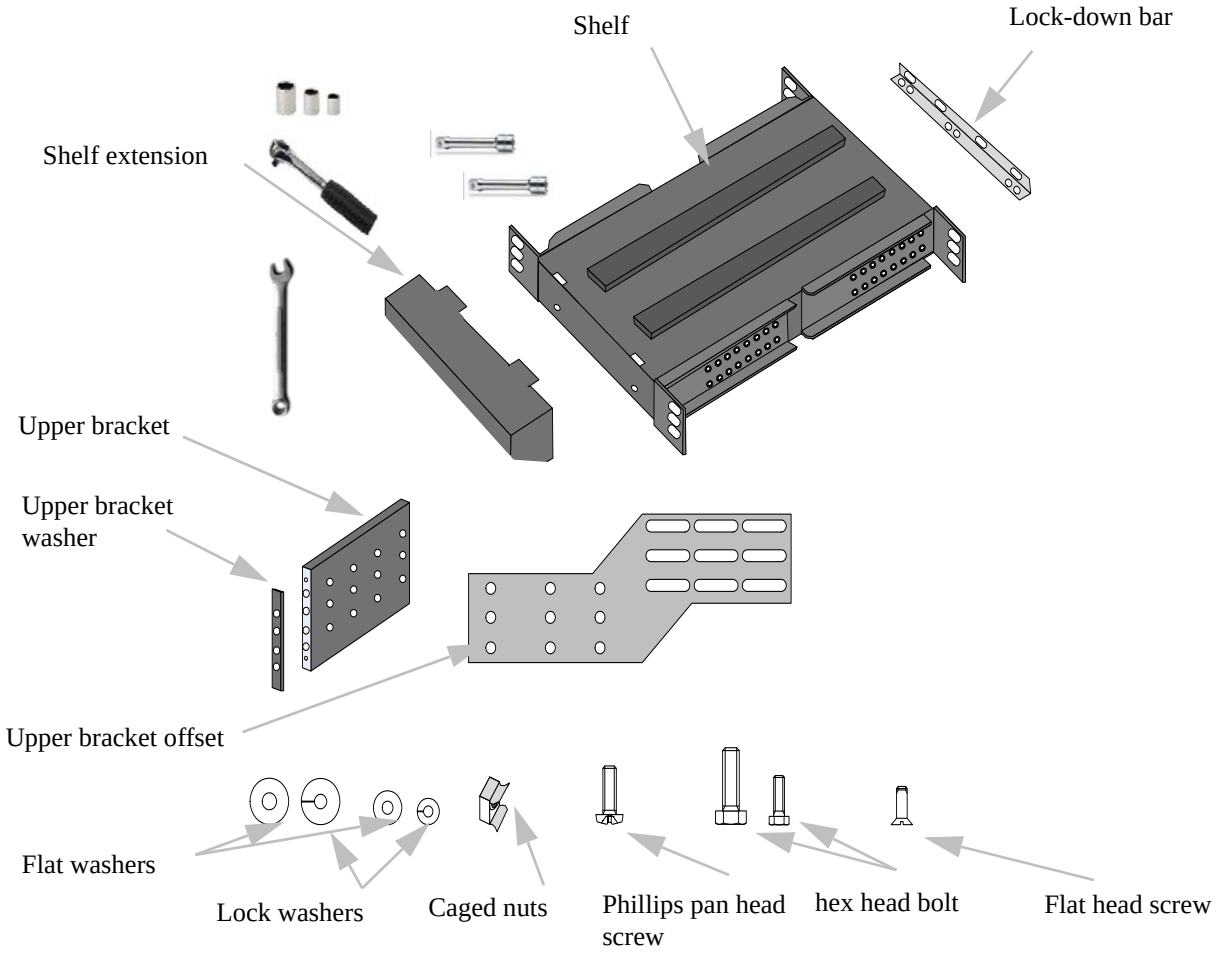
- 1 shelf with brackets pre-installed
- 1 left side upper bracket offset
- 2 lock down bars
- 8 lock washers for the upper brackets to vertical support
- 10 hex head bolts – 8 for the upper brackets and 2 for the shelf extension
- 20 pan head screws for the caged nuts 12 for the shelf and 8 for the chassis faceplate
- 32 lock washers – 20 for the lock down bars and 12 for the upper brackets to upper bracket offsets
- 2 upper brackets
- 1 open end ratchet wrench 10mm
- 1 socket wrench
- 2 extensions for the socket driver
- 1 shelf extension
- 1 right side upper bracket offset
- 2 upper bracket washers
- 12 lock washers for the upper brackets to upper bracket offsets
- 20 caged nuts 12 for the shelf and 8 for the chassis faceplate
- 20 flat washers– 8 for the lock down bars and 12 for the upper brackets
- 32 hex head bolts – 20 for the lock down bars and 12 for the upper brackets to upper bracket offsets
- 12 flat head screws with locktite for the upper bracket offsets
- 1 socket nut driver 8mm
- 1 socket nut driver 10mm
- 1 socket nut driver 14mm

- flat washers for the shelf extension
- 1 box wrench

• Parts included in the cable management installation kit:

- 1 cable management rack RH
- 1 cable management rack LH
- 14 caged nuts M6
- 14 M6 bolts

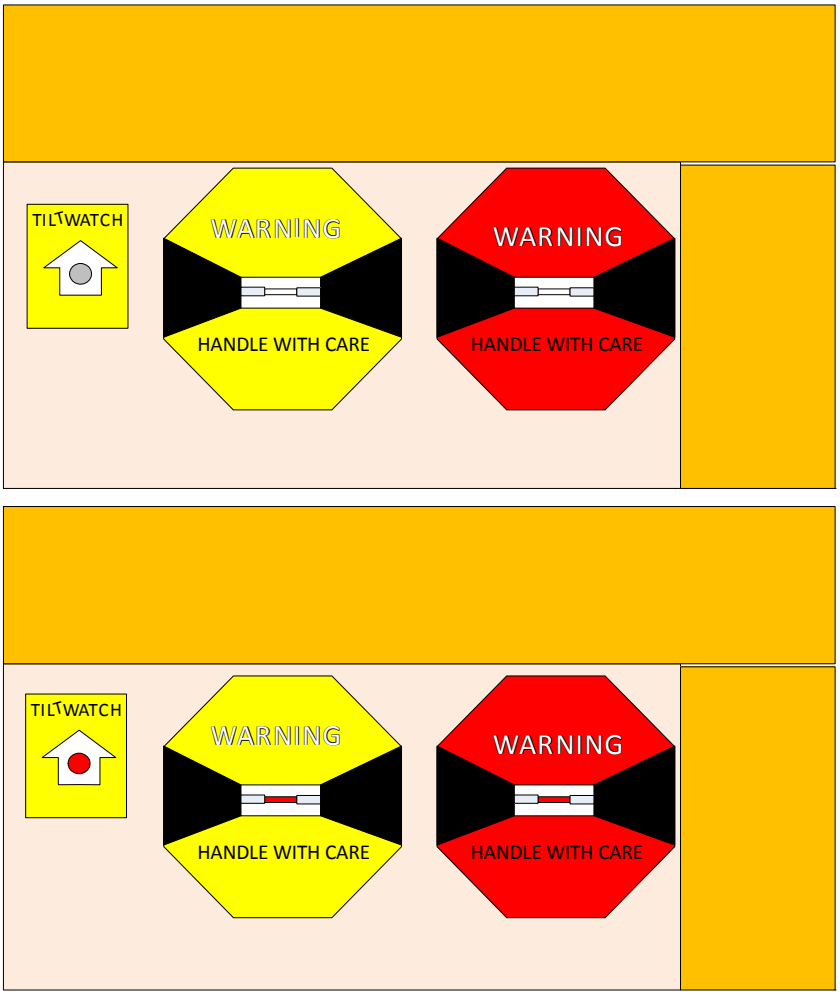
Figure 16: Installation Kit Parts



3.6.3.3 Container Mishandling

The container has shock and tilt stickers applied. These will turn red if the container has been mishandled or roughly handled. Upon receipt of the container look for and inspect the shock and tilt stickers to confirm that they have not tripped. If one or more are red notify the shipper and Mellanox. This on its own does not indicate damage to the contents. But, be sure to carefully inspect the contents if any of the shock and tilt stickers have tripped.

Figure 17: Shock and Tilt Stickers



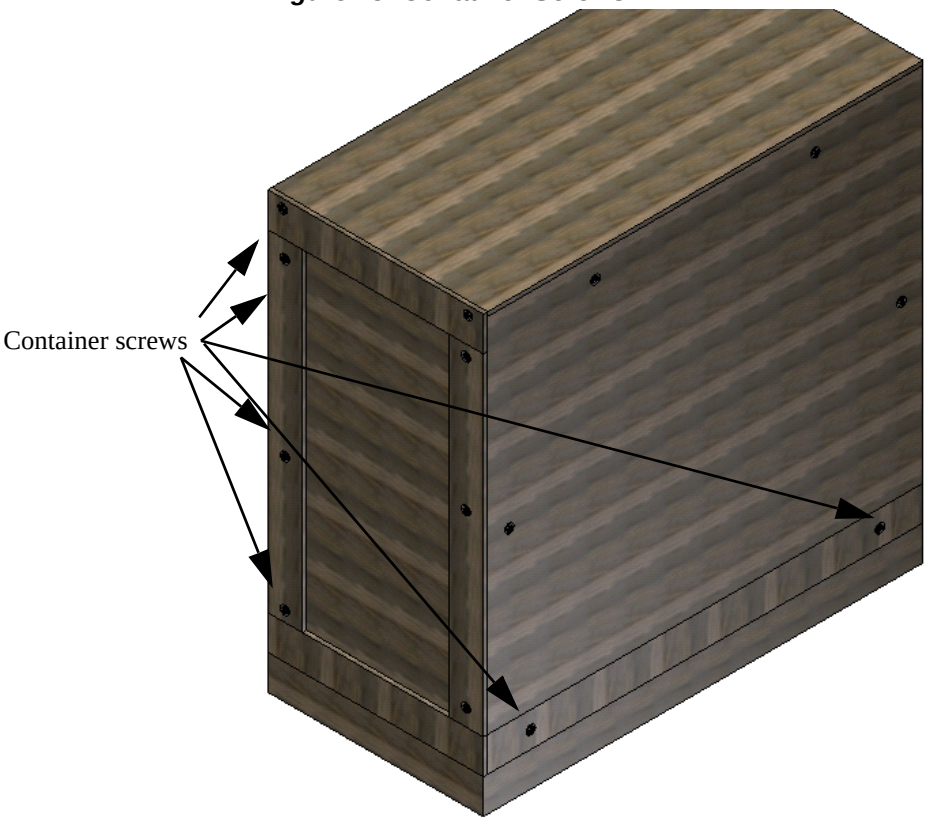
Stickers unaffected by shipping

Stickers showing excessive shock or tilt.

3.6.3.4 Opening the Container

1. Before starting the procedure, put the ESD strap on and connect it to a valid ground.

Figure 18: Container Screws



It is highly recommended to have a screw gun or electric screwdriver for this step.

2. Remove the four sides of the container by unscrewing the phillips head screws holding the sides on.
3. Remove and put aside the box.
4. Visually inspect the chassis, make sure that:
   - there is no visible damage
   - 6 PSUs are installed for the chassis
   - all 4 fans are installed
5. Remove all protective plastic film from all sides and top of the chassis.

The leafs, spines, and management modules are shipped separately.

Do not remove any of the blocks or either of the lock-down bars at this time.

3.6.3.5 Installing the Shelf

The chassis is on ball bearings and can roll easily. Be aware that the chassis can roll off of the pallet. **Should the chassis start to fall, move out of the way.** The chassis can cause grave bodily harm should it fall on or near you.

1. Select the location in the rack. Try to keep the chassis as low as possible to keep the center of gravity low.

It is recommended to set the top of the shelf at U5. Try and keep the chassis as low as possible.

Placing the shelf too low may make it impossible to tighten the shelf brackets, in step 9

The maximum height that the chassis can be mounted, will be determined by the maximum height that the fork lift can raise the pallet.

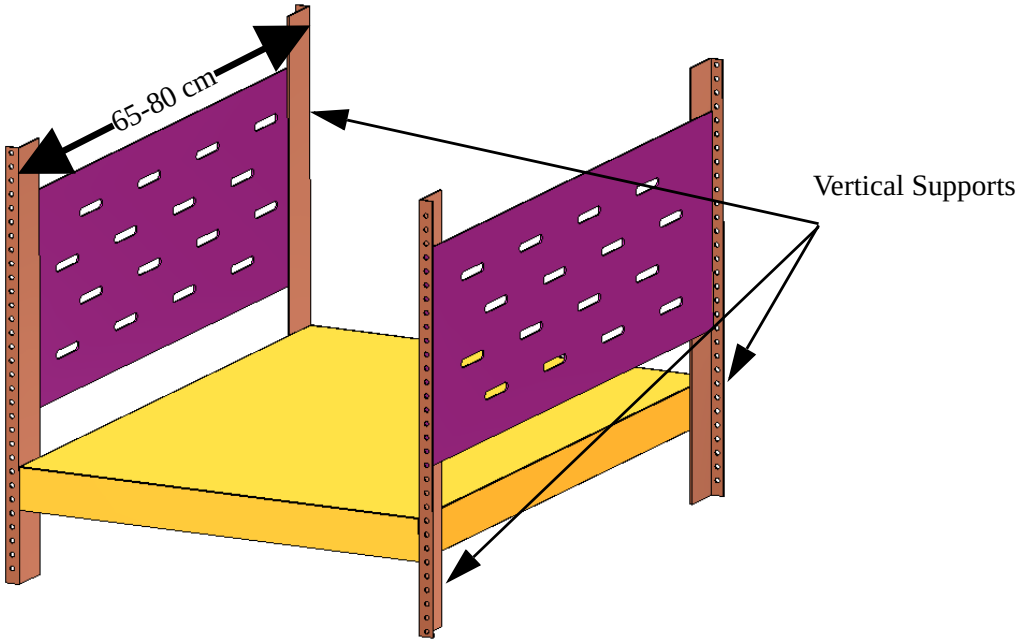
2. Open the Installation kit and make sure that all of the parts are in the box. See Figure 16,“Installation Kit Parts”.

The chassis will sit in the rack with the spine side as close as possible to the door. This leaves maximum room for the cable management system.

The distance between the vertical supports must be between 65 cm(25.6”) and 80 cm(31.5”). If the distance in your rack is different, move the vertical supports so that one pair is ~10 cm(4in.) away from the door.

The side of the chassis with the spine units will sit flush with the vertical supports of the rack. The side of the chassis with the QSFP connectors will sit at the edge of the shelf closer to the center of the rack.

Figure 19: Vertical Rack Supports Dimension



3. Measure the distance between the vertical supports and adjust the shelf brackets according to this distance. This chassis can be installed in a rack with a distance between the vertical supports of from 65cm(25.6in.) to 80cm(31.5in.).
4. The shelf comes with the four brackets pre-installed. Two of the brackets should be loose. They may need to be removed and repositioned to meet the distance between the vertical supports of the rack.

Figure 20: Adjustable Shelf Brackets

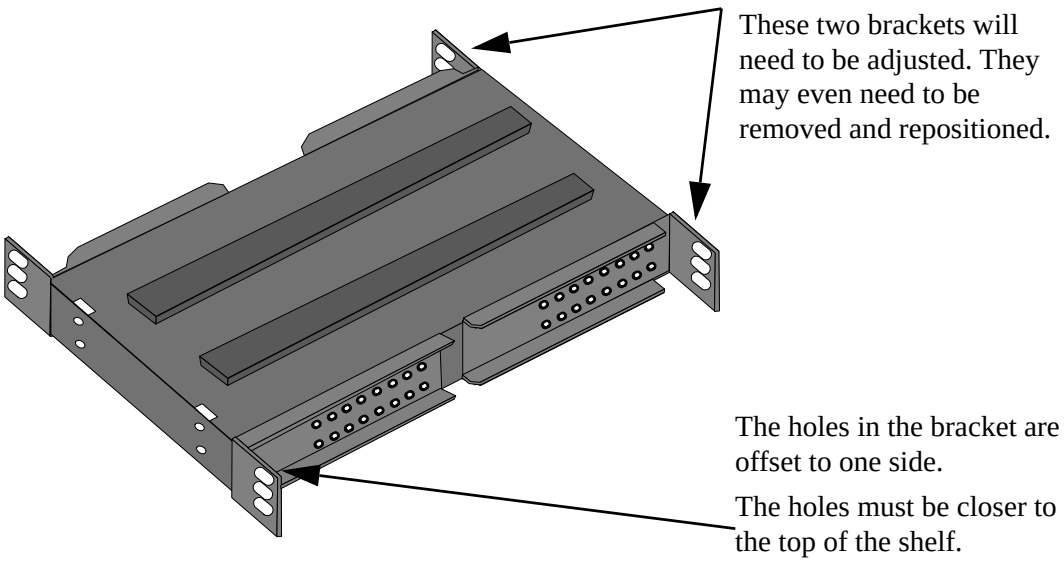
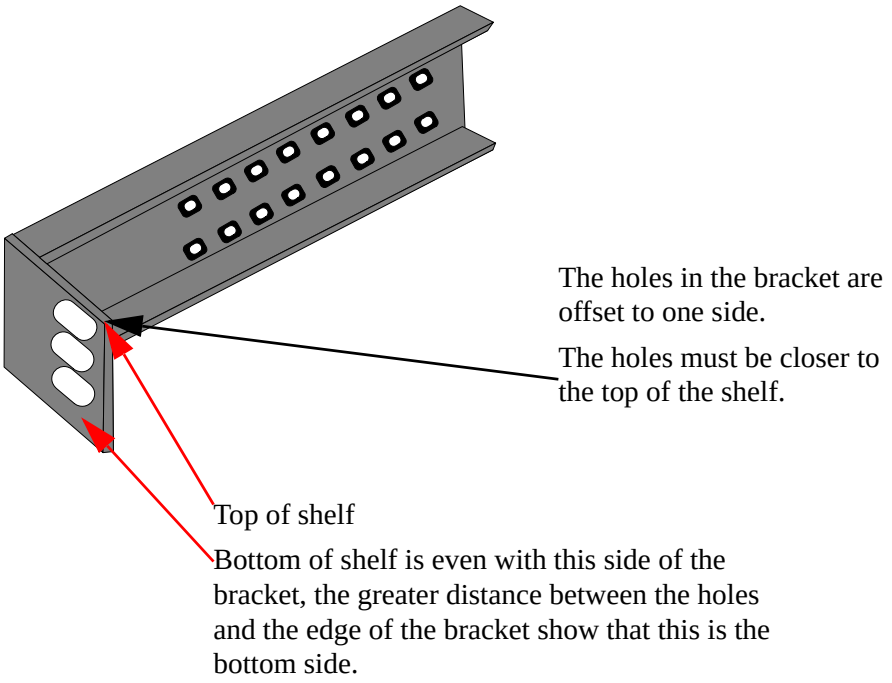

These two brackets will need to be adjusted. They may even need to be removed and repositioned.
The holes in the bracket are offset to one side.
The holes must be closer to the top of the shelf.

Figure 21: Top of Shelf Bracket


The holes in the bracket are offset to one side.
The holes must be closer to the top of the shelf.
Top of shelf
Bottom of shelf is even with this side of the bracket, the greater distance between the holes and the edge of the bracket show that this is the bottom side.

5. Move the shelf brackets on the shelf. Place the shelf bracket so that it measures slightly more than the measured distance between the vertical rack supports. Make sure that there is enough play in the bracket so that it can move to the vertical support. **Do not tighten the hex head bolts.**

You may need to remove the brackets and reinstall them.

Figure 22: Placing the Shelf Bracket

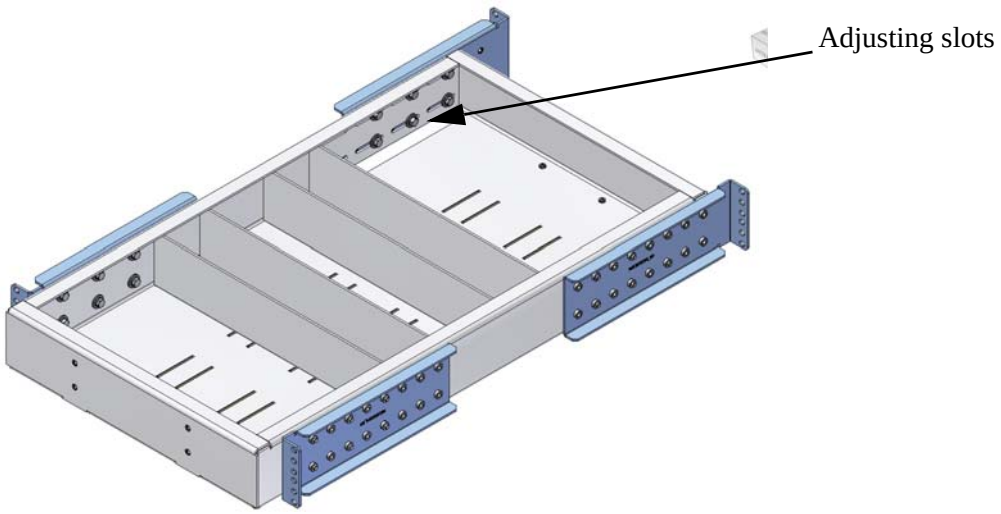
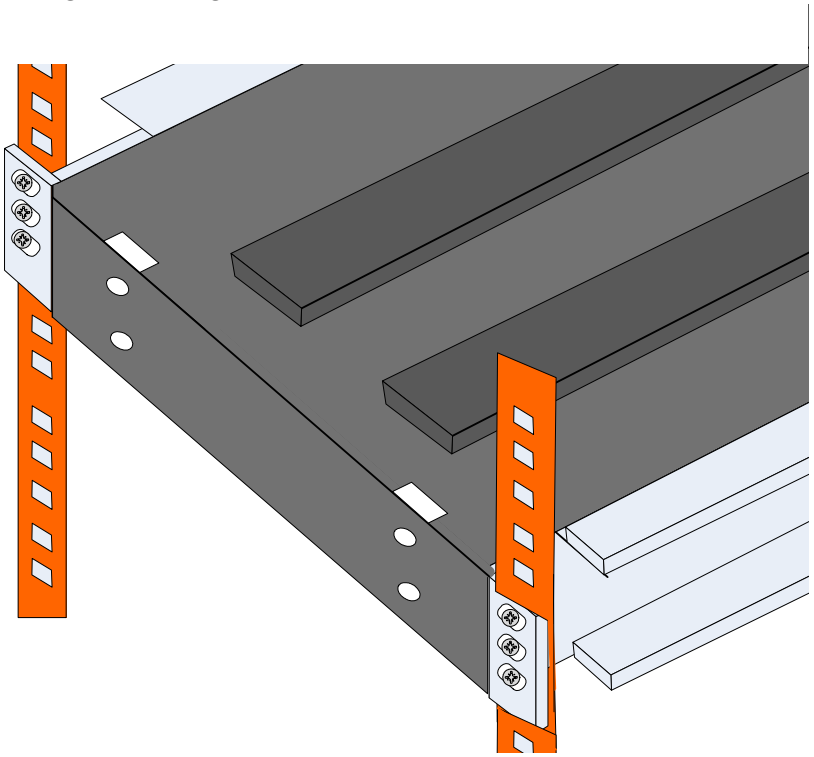
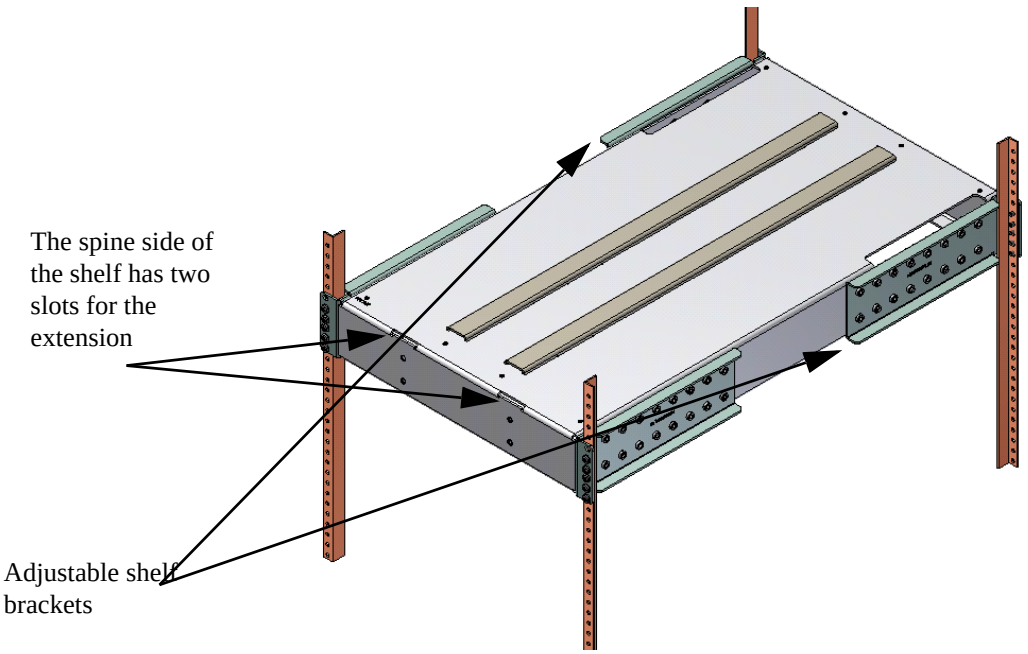


Figure 23: Caged Nut Locations for the Shelf Brackets



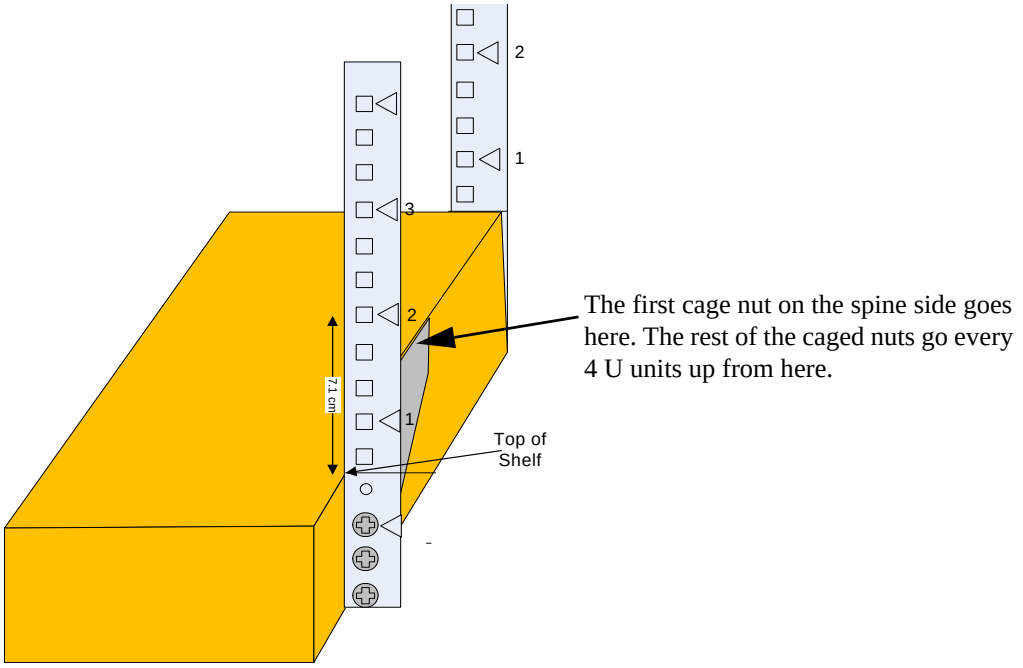
6. Insert three caged nuts into the rack for each of the four shelf brackets (the 2 brackets that are adjustable and the 2 that are fixed). Make sure that the caged nuts are all at the same height on the vertical supports.
7. Put the Shelf into the rack and twist the shelf into place. Make sure the spine side of the shelf is closest to the rack doors. See Figure 24 to identify the spine side of the shelf.
8. Install and tighten the 12 M6 bolts into the caged nuts.

Figure 24: Shelf Brackets



9. Tighten the 16 hex head bolts on the adjustable brackets.

Figure 25: U Numbering Above Shelf


2
1
3
2
1
7.1 cm
The first cage nut on the spine side goes here. The rest of the caged nuts go every 4 U units up from here.
Top of Shelf

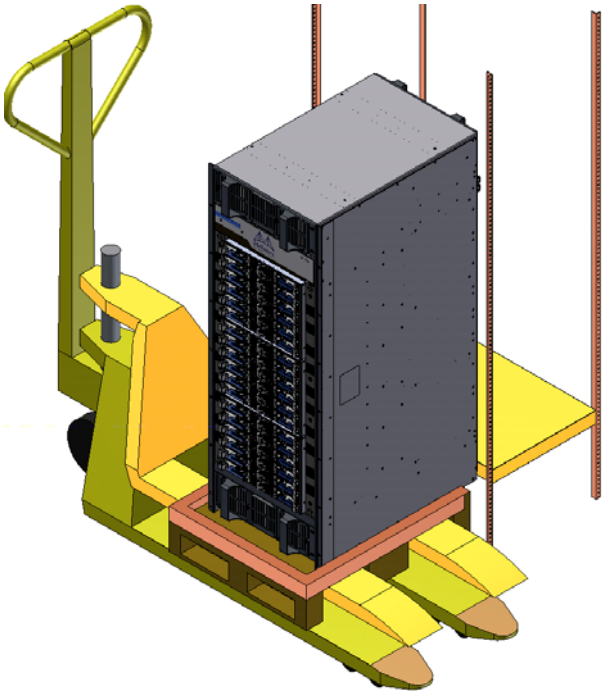
10. Place 8 caged nuts into the vertical rack support at the locations corresponding to the holes in the chassis faceplate. The holes in the faceplate start at 2U above the shelf and are spaced every 4U centered as you go up the vertical rack support. There are 4 holes on each side.

3.6.3.6 Inserting the Chassis

The chassis is on ball bearings and can roll easily. Be aware that the chassis can roll off of the pallet. **Should the chassis start to fall, move out of the way.** The chassis can cause grave bodily harm should it fall on or near you.

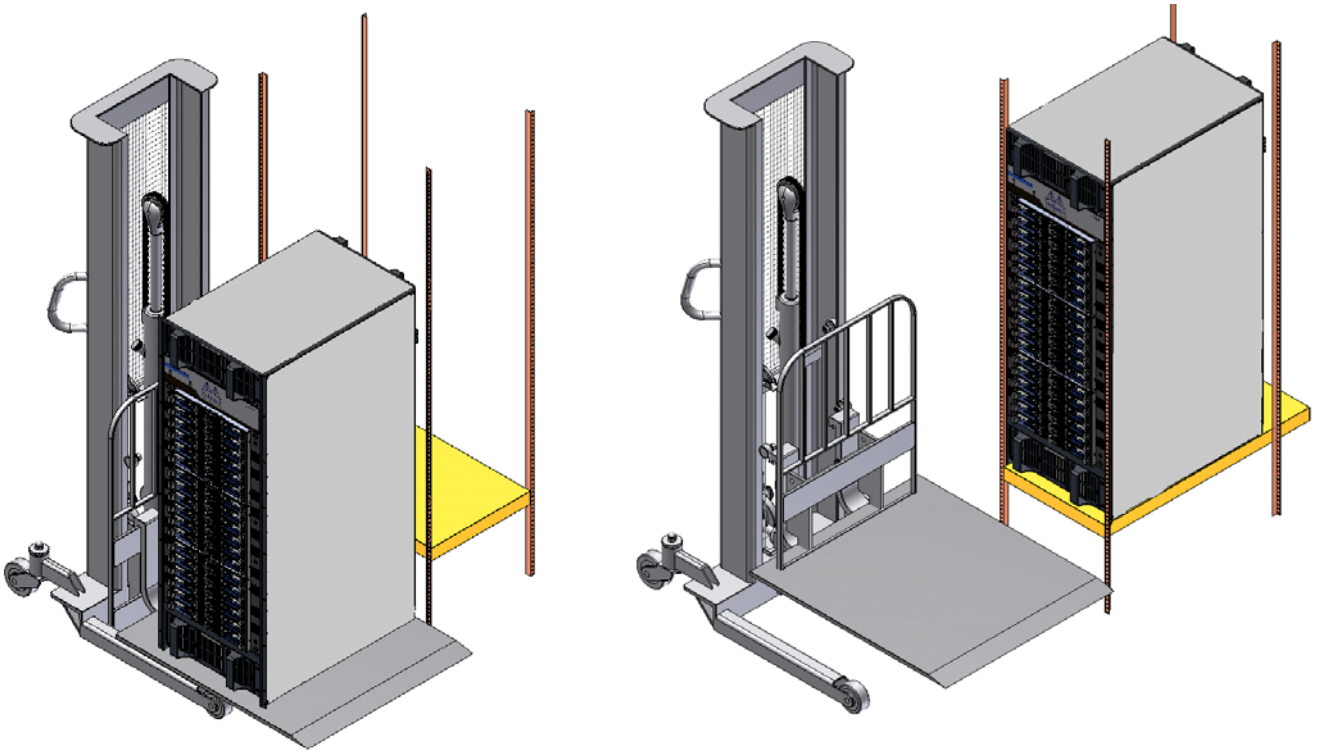
1. Put the container on the fork lift.

Figure 26: Putting the Chassis in the Rack Using a Fork Lift



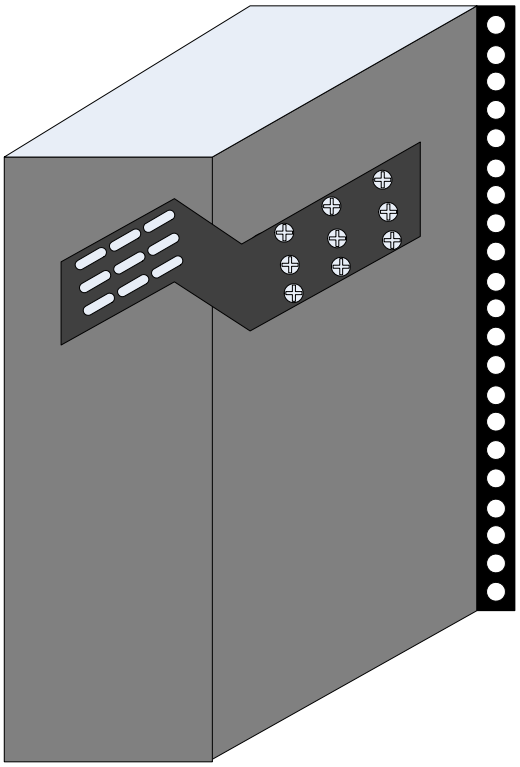
The chassis is screwed down to the pallet on both the spine side and the leaf side.

Figure 27: Putting the Chassis in the Rack Using a Mechanical Lift



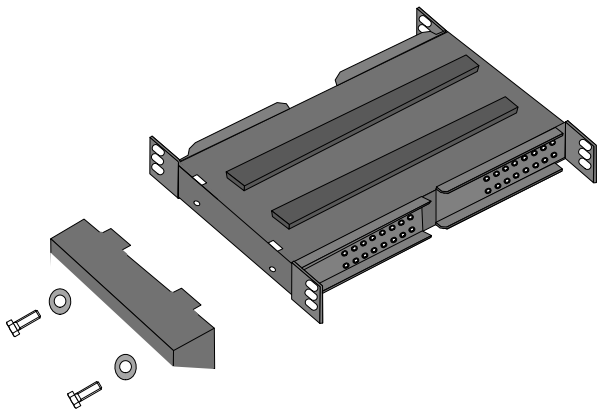
The chassis is screwed down to the pallet on both the spine side and the leaf side.

Figure 28: Place the Upper Bracket Offset



2. Screw on the two Upper Bracket offsets onto the chassis using nine flat head screws for each offset.

Figure 29: Attach the Shelf Extension



3. Screw on the shelf extension using two bolts with flat washers.
4. If you are installing the cable management system, place 10 caged nuts on the other side of the rack in the vertical supports.
5. Place caged nuts in all of the locations specified in Figure 16. The black holes show where to place caged nuts; the red holes show the location of the upper brackets on the leaf side.

Figure 30: Caged Nut Placement by U Numbers

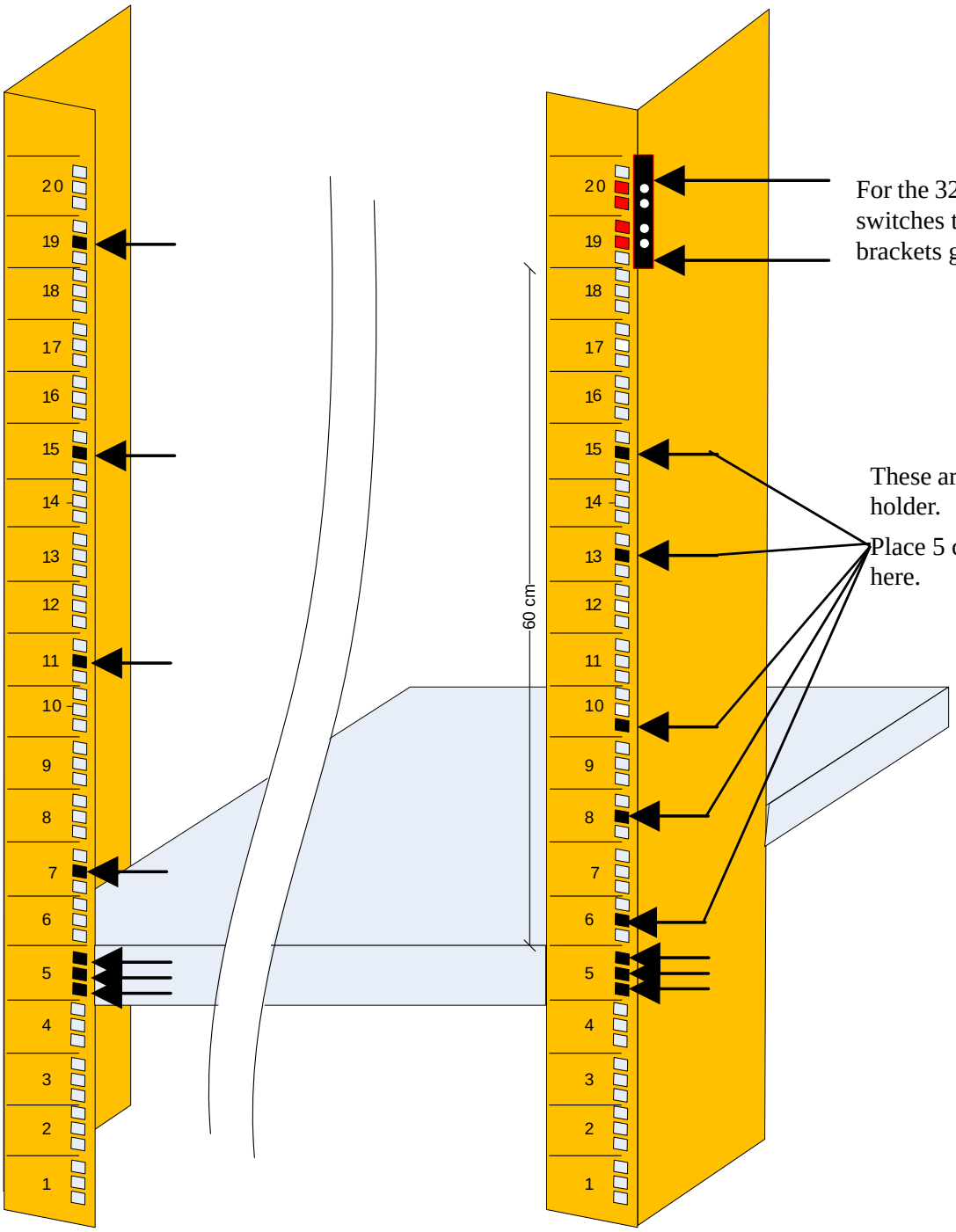
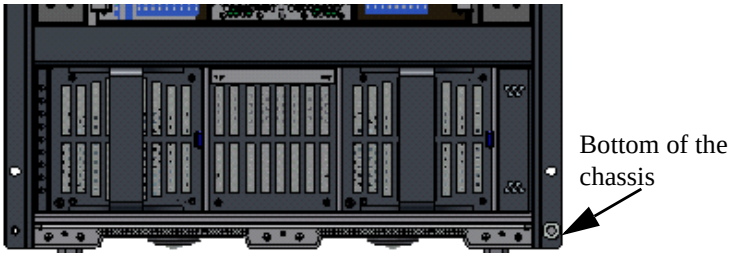
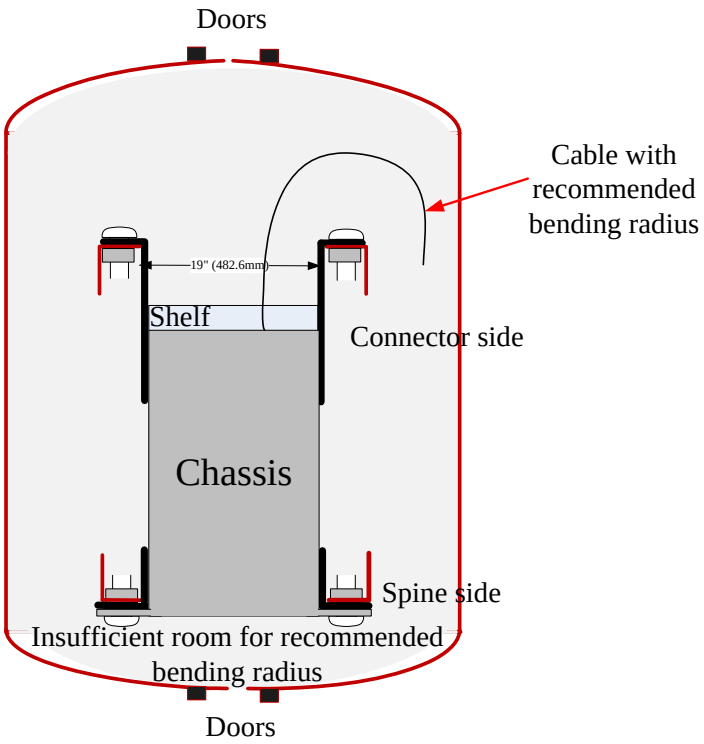


Figure 31: Location for the Lock-down Bar



6. Unscrew both lock-down bars.
7. Decide which side of the rack you want the data connectors.

Figure 32: Placement of Chassis in Rack



You will most likely need extra room for cable bending on the connector side of the chassis and should plan to keep the spine side as close to the rack door as possible, thus having more room for the cables.

8. Place the chassis in front of the rack and as close as possible to the rack.

Figure 33: Fork Lift

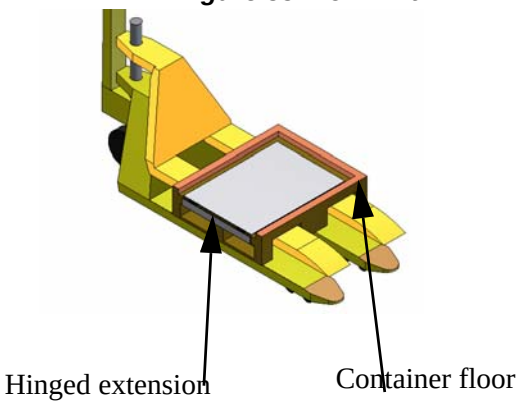
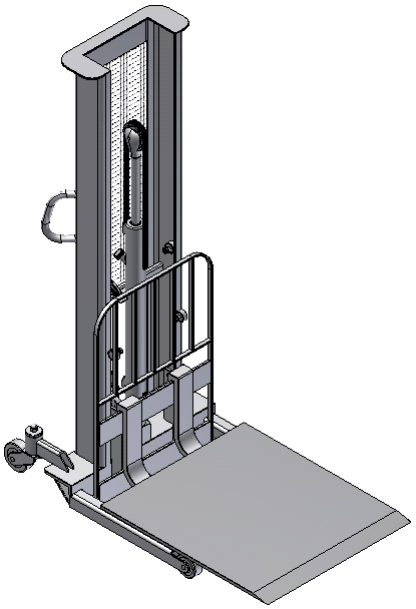


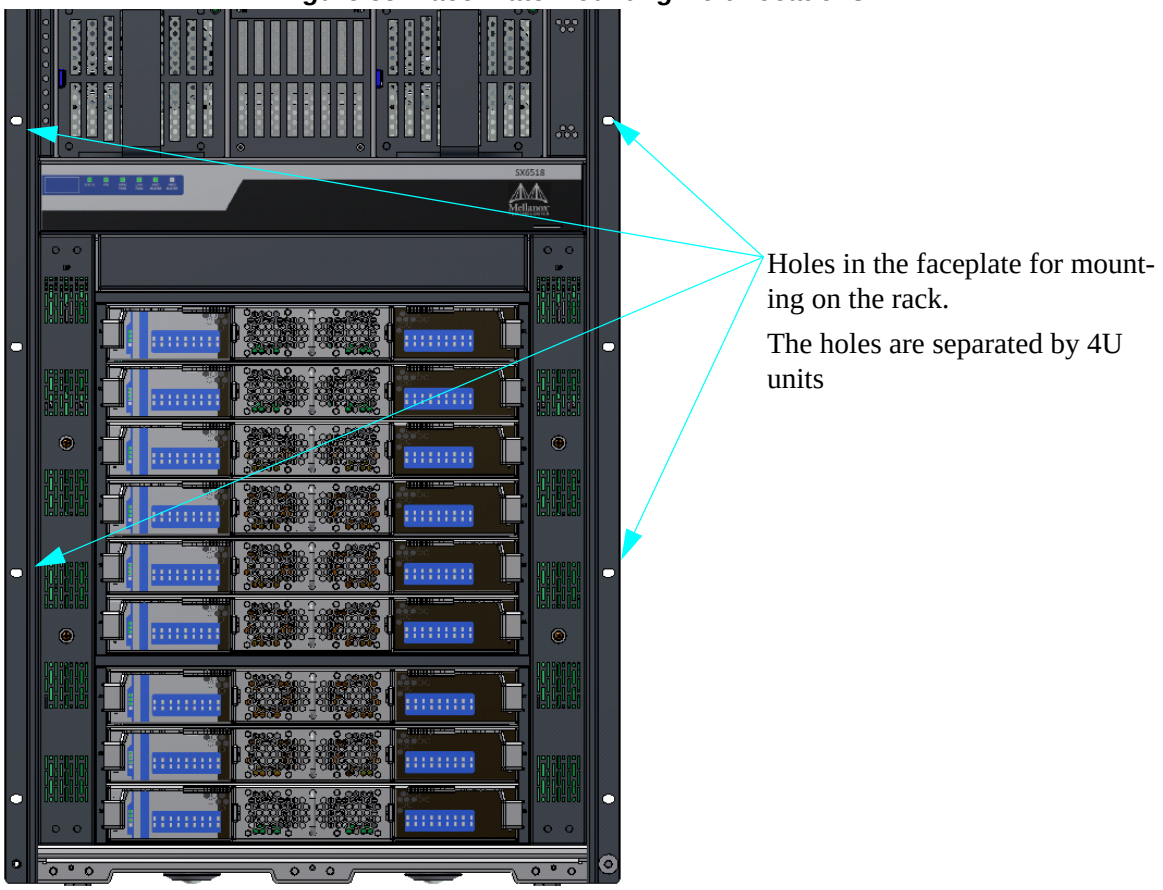
Figure 34: Mechanical Lift



9. Raise the chassis so that it is ~5cm above the shelf in the rack.
10. Raise the hinged extension on the container floor.
11. Lower the chassis until the hinged extension is sitting on the shelf extension.
12. Push the chassis from the container to the shelf.

Save the container pallet to remove this chassis. It will be necessary for the removal and disposal procedures.

Figure 35: Face Plate Mounting Bolt Locations



13. Slide the chassis onto the shelf and determine the location of the upper brackets, on the vertical supports on the connector side of the chassis.

Do not move the forklift away from the rack just yet.

14. Confirm that the caged nuts for the faceplate are in the correct location.
15. Slide the chassis out just far enough to install the upper brackets. See Figure 36.

Figure 36: Upper Bracket Installation

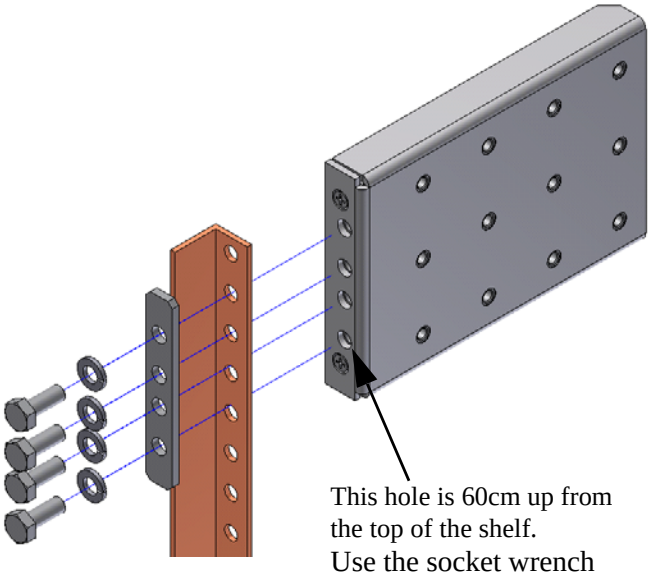
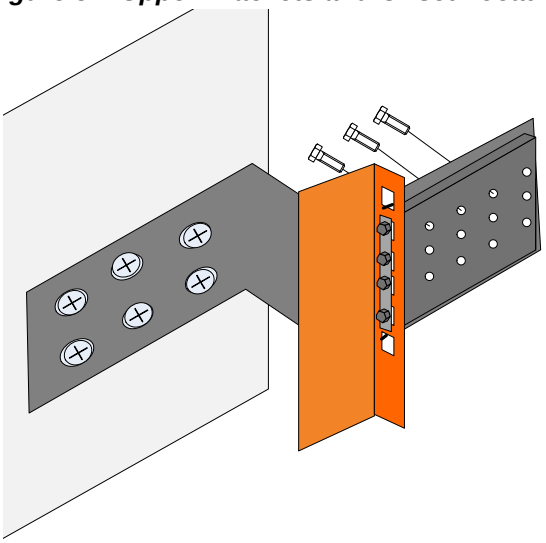
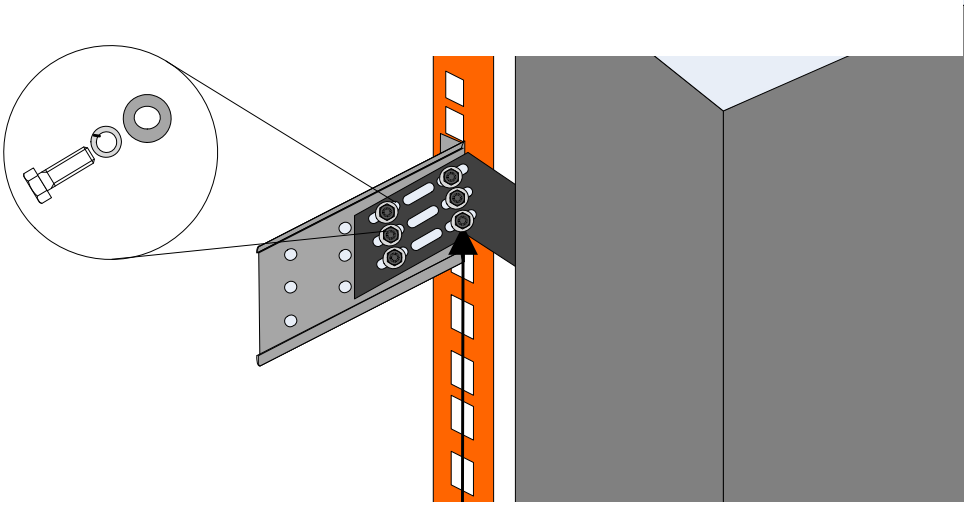


Figure 37: Upper Brackets and Offset Location



16. Screw the upper brackets onto the vertical supports and tighten in place. See Figure 37. You will need the socket wrench with both extensions to tighten these bolts.
17. Slide the chassis onto the shelf until the face plate of the chassis touches the vertical rack support.
18. Make sure the upper brackets are installed in their correct location.
19. Screw the 8 bolts through the faceplate into the caged nuts, DO NOT TIGHTEN.

Figure 38: Offset to Upper Bracket Bolts



20. For each offset and upper bracket, screw six bolts through the offset into the upper bracket. See Figure 38. Use one flat washer and one lock washer for each of these bolts. DO NOT TIGHTEN.

Figure 39: Location for the Lock-down Bar

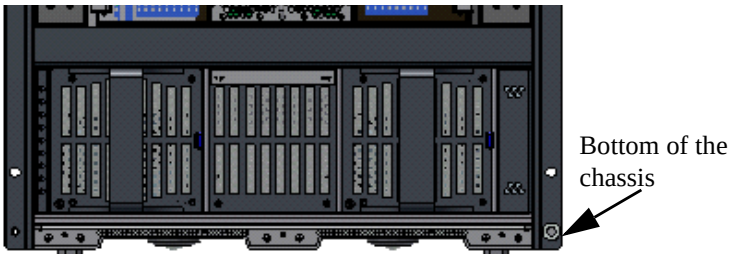
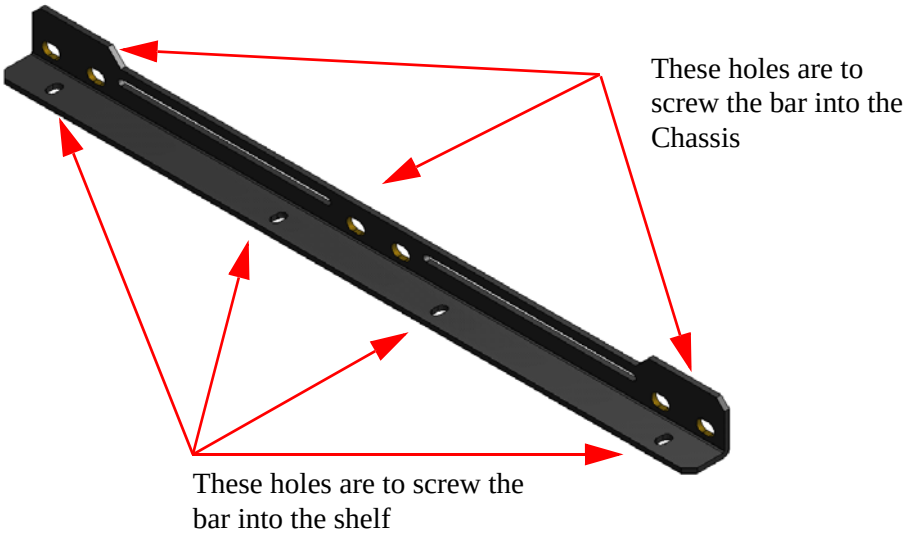
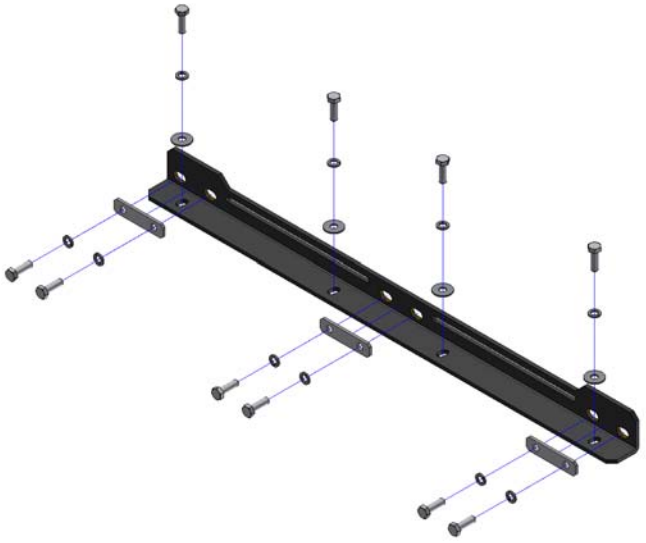


Figure 40: Lock-Down Bar



21. Place the front lock-down bar at the edge of the chassis and align the holes in the lock-down bar with the holes in the shelf. Screw down the lock-down bar.You will need the 10 hex head screws and washers for each lock down bar. DO NOT TIGHTEN
22. Screw down the second lock-down bar.

Figure 41: Lock Down Bars Bolt and Washer Order

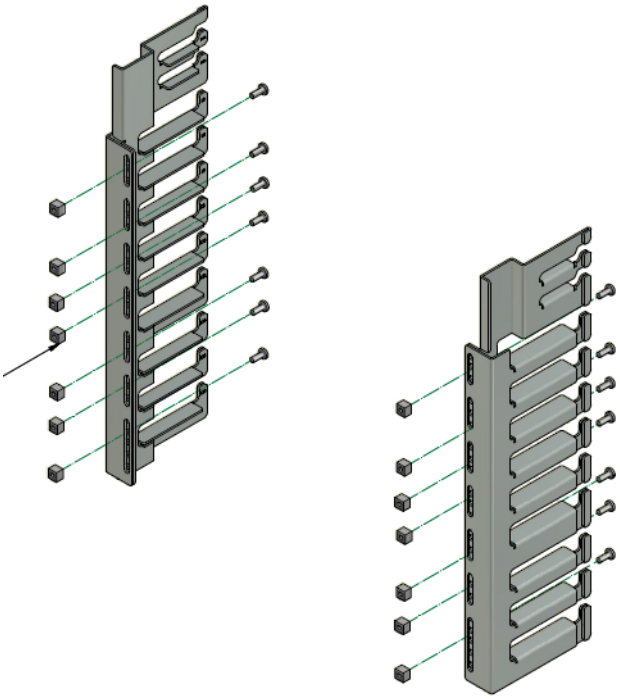


23. Remove the shelf extension and save for removal of the chassis.
24. Connect a valid ground, See Section 3.6.5, “Ground Connections,” on page 58, for detailed instructions.
25. Tighten the faceplate screws. See Figure 35.
26. Tighten the upper bracket to upper bracket offset screws. See Figure 38.
27. Tighten the lock down bars. See Figure 41.
28. Go to Section 4, “Chassis Power Up,” on page 63 to power up the switch system.

3.6.4 Installing the Cable Holder

Now is the time to install the cable holder.

Figure 42: Cable Holder



1. Place the Cable holder next to the rack, on the connector side of the chassis, and identify the holes where the caged nuts were placed in step 4

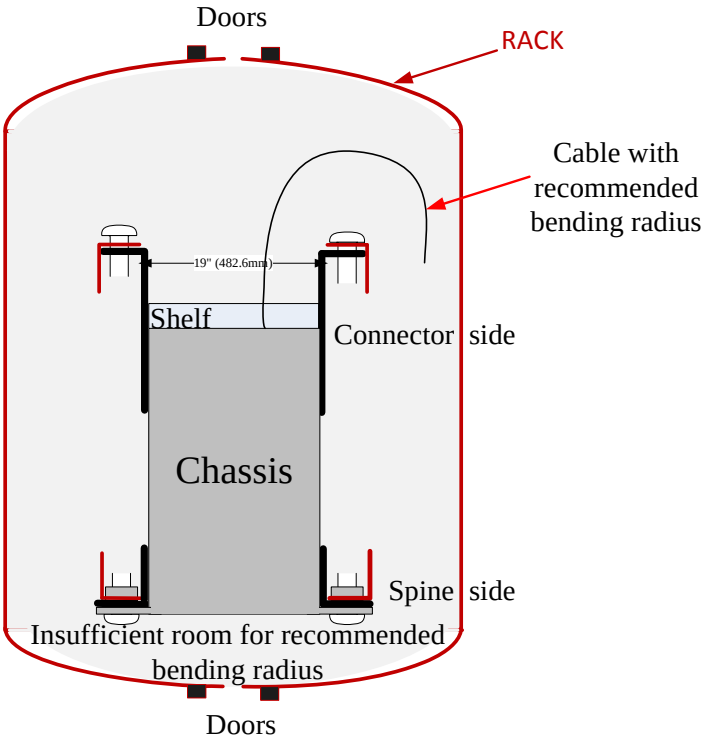
The cable holders should go to the outside of the vertical supports.

2. Set the bottom of the cable holder at the level of the shelf.

If the cable holder is not set properly the upper bracket will not line up with the cable holder.

3. Screw the cable holder onto the rack using the screws provided.
4. Repeat steps 1- 3 for the second cable holder.

Figure 43: Placement of Chassis in Rack



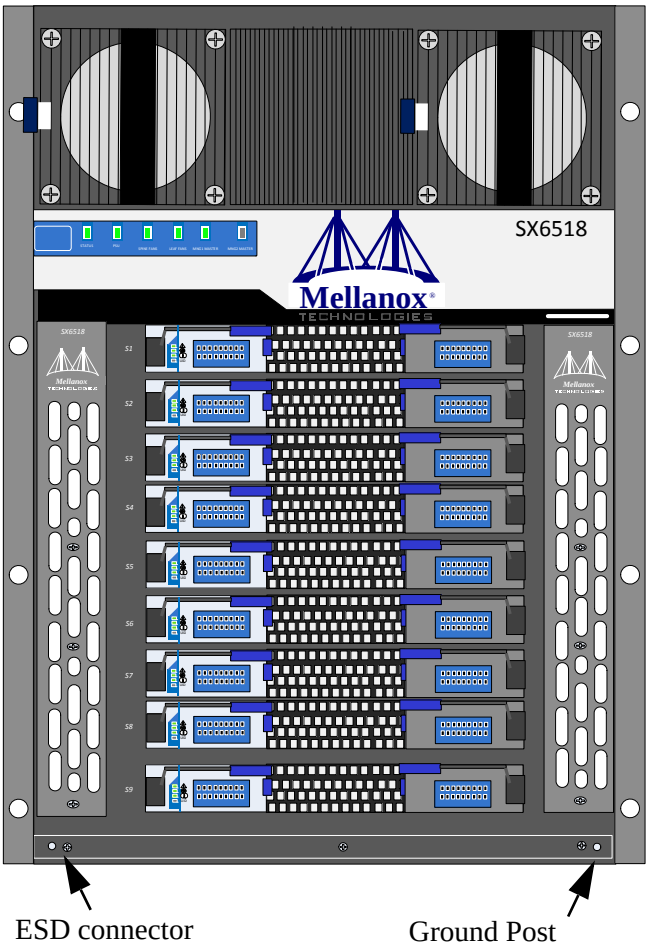
You will most likely need extra room for cable bending on the connector side of the chassis and should plan to keep the spine side as close to the rack door as possible, thus having more room for the cables. See Figure 3.6.5 on page 58.

3.6.5 Ground Connections

Make sure to connect the ground post to a valid electrical ground. Use a grounding lug and a ground wire of sufficient capacity to safely convey a potential discharge. The grounding post is M-6 with 1mm pitch threads. A ground wire of AWG 6 or 4mm diameter is recommended for grounding this device. The chassis is concurrently grounded through each of the PSUs. Only connect the PSU cords to properly grounded outlets. Do not rely on the PSU grounds. It is absolutely necessary to connect the grounding post. Make sure the connections are solid and permanent. If you choose to not use the ground screw, make sure that the rack is properly grounded and that

there is a valid ground connection between the chassis of the switch and the rack. Test the ground using an Ohm meter.

Figure 44: Ground Connection



3.7 Power Connections

The switch includes integrated hot-swap power supplies which support up to 6 load-sharing 1000W or 1600W supply units. The slots for the power supply units (PSUs) are on the spine side. The left side has odd numbered PSUs and the right side has even numbered PSUs. Each PSU has a dedicated AC inlet. This design enables the optional use of separate main and backup AC feeds. The input voltage is Autorange, 100-240 VAC, 50Hz or 60Hz. The output voltage for the PSUs is 48V. The power cords should be standard 3-wire AC power cords including a safety ground.

3.7.1 Powering Up the Switch Platform

Make sure that the power cords are compatible with your outlets. Power cords for different countries can be ordered from Mellanox.

The chassis in N+1 mode must be started with a full complement of PSUs, thereafter it can run on one less than the total number of PSUs. This final PSU is redundant and

allows for hot swapping a PSU should one fail. Connecting the PSUs to different AC lines provides AC failover protection.

When using the 1600W PSUs, the minimum complement of power supply units to start the chassis is 3 and the chassis will continue to run at full capacity with only 5321 PSUs.

The system should continue to run and allow a hot swap of a defective PSU. Should there not be enough power to keep all of the leafs running, MLNX-OS™ may power down some leafs. If this happens it may be necessary to reboot the chassis once the defective PSU has been replaced. Two simple ways to reboot is to use the reboot command in the CLI or reboot through the Web GUI.

The power system will divide the current consumption by the number of working PSUs. Should one of the PSUs fail, the total current consumption will then be divided by the remaining working PSUs. When the failed PSU is hot swapped the new PSU will ramp up and pass its share of current, so that the total current is always divided by the number of working PSUs.

1. Plug in the power cords to the PSUs.
2. Plug the other end of the power cords into grounded outlets.

Make sure that the outlets and circuits will not be overloaded. Spread out the load over at least two or three circuits or use a 3 phase circuit.

Figure 45: Multiple Power Inlets - Electric Caution Notification

CAUTION	ACHTUNG	ATTENTION
Risk of electric shock and energy hazard. The PSUs are all independent. Disconnect all power supplies to ensure a powered down state inside of the switch platform.	Gafahr des elektrischen Schocks. Entferrnen des Netzsteckers elnes Netzteils spannungsfrei. Um alle Einhieten spannungsfrei zu machen sind die Netzstecker aller Netzteile zu entfernen	Risque de choc et de danger e’lectriques. Le de’branchment d’une seule alimentation stabilise’e ne de’branch uniquement qu’un module “Alimentation Stabilise’e”. Pour isoler completement le module en cause, Il faut de’brancher toutes les alimentations stabilise’es.

3. Check the Status LEDs on all of the management modules and confirm that all of the LEDs show status lights consistent with normal operation.

Any yellow or red status LEDs on any of the management modules is cause for concern and must be dealt with immediately.

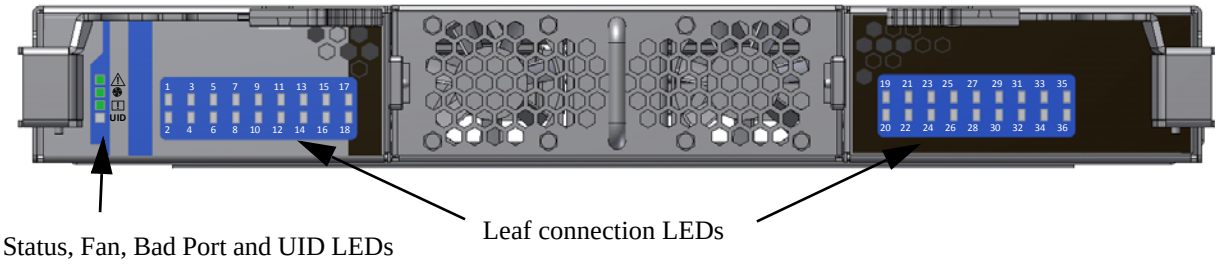
4. Check that none of the LEDs on the spines are yellow.

It can take up to 5 minutes to boot up the system. Turn off the system if any LEDs remain red for more than 5 minutes.

5. Check that the Leaf status LEDs, Fan status LED, and Spine status LED in the spines are all green.

The maximum number of connections from each leaf is 2. If the (number of leafs x the maximum number of connections per leaf) is less than 36 then some of the leaf to spine connection LEDs may be OFF.

Figure 46: Spine Module



3.8 InfiniBand QSFP Cable Installation

The switch uses industry standard QSFP InfiniBand cables which are available from Mellanox Technologies. The Mellanox proprietary QSFP cables support full 56+56Gb/s (FDR), 40+40Gb/s (FDR10), 40+40Gb/s (QDR), 20+20Gb/s (DDR) and 10+10Gb/s (SDR) bidirectional wire speed of the switch ports. All InfiniBand QSFP connections are made to the leaf boards. Each leaf has 18 InfiniBand QSFP connectors in two rows, which are numbered 1-18. See Section 2.3.6 for port numbering.

If maximum cable lengths are exceeded data transfer will be reduced and the bit error rate will increase.

FDR BandWidth is supported only by MLNX QSFP cables.

FDR and FDR10 are only guaranteed to work with approved Mellanox Cables.

All cables can be inserted or removed with the unit powered on. To insert a cable, press the connector onto the port receptacle until the connector is firmly seated. The orange LED indicator above the port will light when the physical connection is established (when both ends of the cable are properly connected to working devices). Allow 15 sec-

onds for link to get up. To remove, disengage the lock and slowly pull the connector away from the port receptacle.

For a valid physical connection both ends of the cable must be connected to working devices.

Take care to not impede the air flow through the ventilation holes next to the Infini-Band ports. Use cable lengths which allow routing horizontally around to the side of the chassis before bending upward or downward in the rack.

3.8.1 Supported Approved Cables

For a list of approved cables for this switch see the Mellanox approved cable list.

http://www.mellanox.com/related-docs/user_manuals/Mellanox_approved_cables.pdf

3.8.2 Cable Power Classes

Chassis and switches need to be able to dissipate the heat generated by high power I/O cables and modules. The Mellanox SX 65XX series chassis are rated for cables up to class 2 as per the SFF committee classification (SFF-8436.PDF).
See http://www.mellanox.com/content/pages.php?pg=cables for the cable class rating of Mellanox cables.

4 Chassis Power Up

Before starting any procedure on the SX6518 system put an ESD prevention wrist strap on your wrist and connect to the SX6518 chassis.

With N+1 PSU redundancy the chassis must be started with a full complement of possible PSUs, thereafter it can run on one less than the total number of PSUs. This final PSU is redundant and allows for hot swapping a PSU should one fail. Connecting the PSUs to different AC lines provides AC failover protection.

The system should continue to run and allow a hot swap of a defective PSU. Should there not be enough power to keep all of the leafs running, MLNX-OS™ may power down some leafs. If this happens it will be necessary to reboot the chassis once the defective PSU has been replaced.

With 1600W optional PSU supplies the chassis can run on as little as 1/2 of the full complement of PSUs. N+N allows the chassis to run on 3PSUs supplied from one power grid while 3 are connected to a second power grid.

1. Check all FRUs for proper insertion and seating before connecting the AC power cords.
   - Boards
   - Power supplies
   - Leaf fan modules
   - Spine fan modules
2. Insert all leafs that you plan to use, in the chassis. Start at the bottom of the chassis and work your way up.
3. Insert the first two spines in the top two slots.
4. Insert the rest of the spines from the bottom of the chassis up to slot #3.
5. Insert thermal blanks in unused leaf slots to maintain balanced air flow.
6. Tighten all leaf and spine mounting screws.
7. Connect the power cords to the PSUs.
8. Connect the power cords to grounded electrical outlets.

With N+1 PSU redundancy do not power up the chassis with less than all PSUs installed.

4.1 Power Supply and Spine Board Indicator Status at Power ON

It can take up to 5 minutes to boot up the system. Turn off the system if any LEDs remain red for more than 5 minutes.

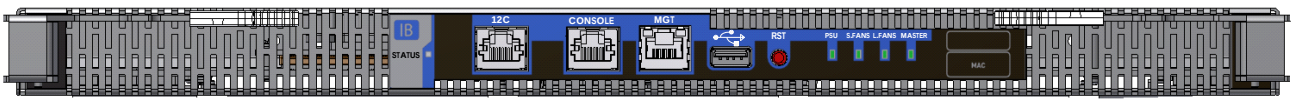
As the power is turned on, you should observe the following conditions for normal operation:

1. Power Supply Unit(s) AC OK and DC OK indicators are ON and FAIL indicators are OFF.
2. There is a *green* Status LED per spine board, per leaf board, and per management module that indicates power supplies are good.
3. Spine Board indicators will display status of internal links to the installed leaf boards. All PHY links to existing leaf Boards should be ON.
4. Check the Spine LEDs and make sure they coincide with Figure 47.

Figure 47: Spine Side Panel Display Status Indications

5. Check the Management Module LEDs and make sure they coincide with Figure 48.

Figure 48: Management Module Status Indications for Normal Operation



5 Insertion and/or Hot swap Extraction

Before starting any procedure on the SX6518 switch system, put an ESD prevention wrist strap on your wrist and connect to the SX6518 chassis.

Do NOT mix replacement parts based on different generations of chip.

Do not install InfiniScale IV based replacement parts within a SwitchX® based chassis and vice versa. All Replacement modules must be consistent with the Chassis family and switch chip generation.

When hot-swapping any of the units, it is necessary to wait 1 minute after removing the defective part before inserting the new part. This is necessary so that the management module will start a new cycle checking through the leafs and spines for the FW versions.

This switch platform supports hot swap capabilities for the parts listed below.

- Power supply units
- Leaf boards
- Spine boards
- Leaf fan module
- Spine fan module
- Management modules

5.1 Power Supply Units

The 1000 W power supplies deliver 1000W at 48V. The input to each of these power supplies requires 1214.46W at 220V in order to output 1000W.

For N+2 configuration PSUs (Power Supply Unit) can be extracted without bringing down the system.

For N+N configuration up to half of the PSUs can go down and the system will continue to run.

The power required to run the switch system is equally divided between all of the working PSUs.

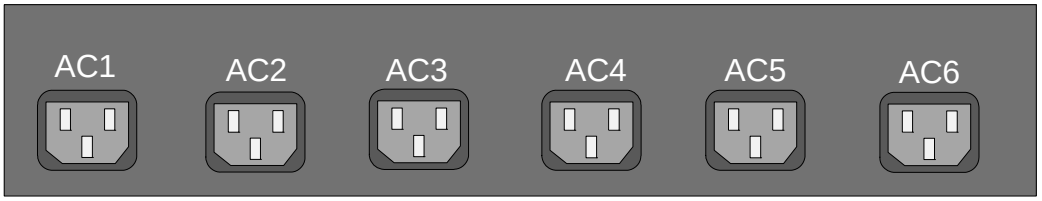
5.1.1 Extracting and Inserting the Power Supply Unit

With all of the 1000W power supplies installed, the system is in N +2 redundant configuration.

With all of the N+N 1600W power supplies installed, the system is in N +N redundant configuration, half of the PSUs may be extracted without bringing down the system. To extract a PSU:

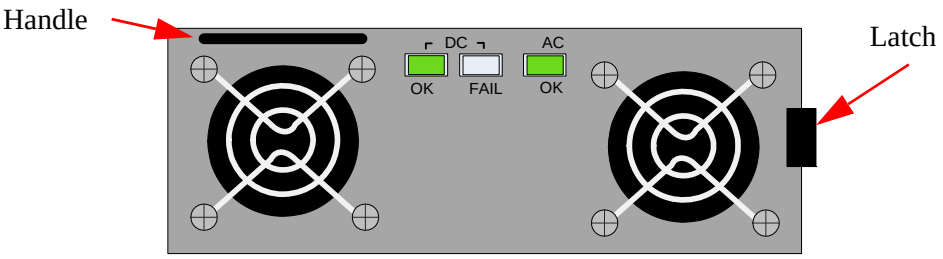
1. Determine which AC connector on the connector side of the chassis corresponds to the defective PSU.
2. Remove the power cord from the power supply unit. Note which power cord it is according to the AC numbering.

Figure 49: Power Cord Numbering



3. On the spine side of the chassis, remove the cover to the power supply unit for the non-working PSU. Odd numbered PSUs are on the left side and even numbered PSUs are on the right side facing the spines.There are four phillips head screws for the cover plate.

Figure 50: Power Supply



4. Grasping the handle with one hand, push the black latch release while pulling the handle outward. As the PSU unseats, the PSU status indicators will turn off.
5. Remove the PSU.

To insert a PSU:

1. Make sure the mating connector of the new unit is free of any dirt and/or obstacles.
2. Insert the PSU by sliding it into the opening until a slight resistance is felt.
3. Continue pressing the PSU until it seats completely. The latch will snap into place confirming the proper installation.
4. Insert the power cord into the supply connector on the other side of the chassis.
5. Replace the cover over the PSUs.

The green indicators should light. If not, extract the PSU and re-insert it again.

5.2 Leaf Boards

Do NOT mix replacement parts based on different generations of chip.

Do not install InfiniScale IV based replacement parts within a SwitchX® based chassis and vice versa. All Replacement modules must be consistent with the Chassis family and switch chip generation.

When hot-swapping any of the units, it is necessary to wait 1 minute after removing the defective part before inserting the new part. This is necessary so that the management module will start a new cycle checking through the leafs and spines for the FW versions.

The leaf boards are numbered from top to bottom, with corresponding numbers displayed to the outside of the leafs vertically along the side panel.

Figure 51: Leaf Board Numbering

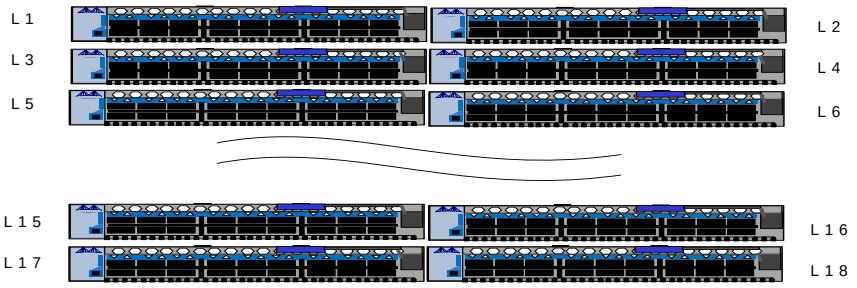
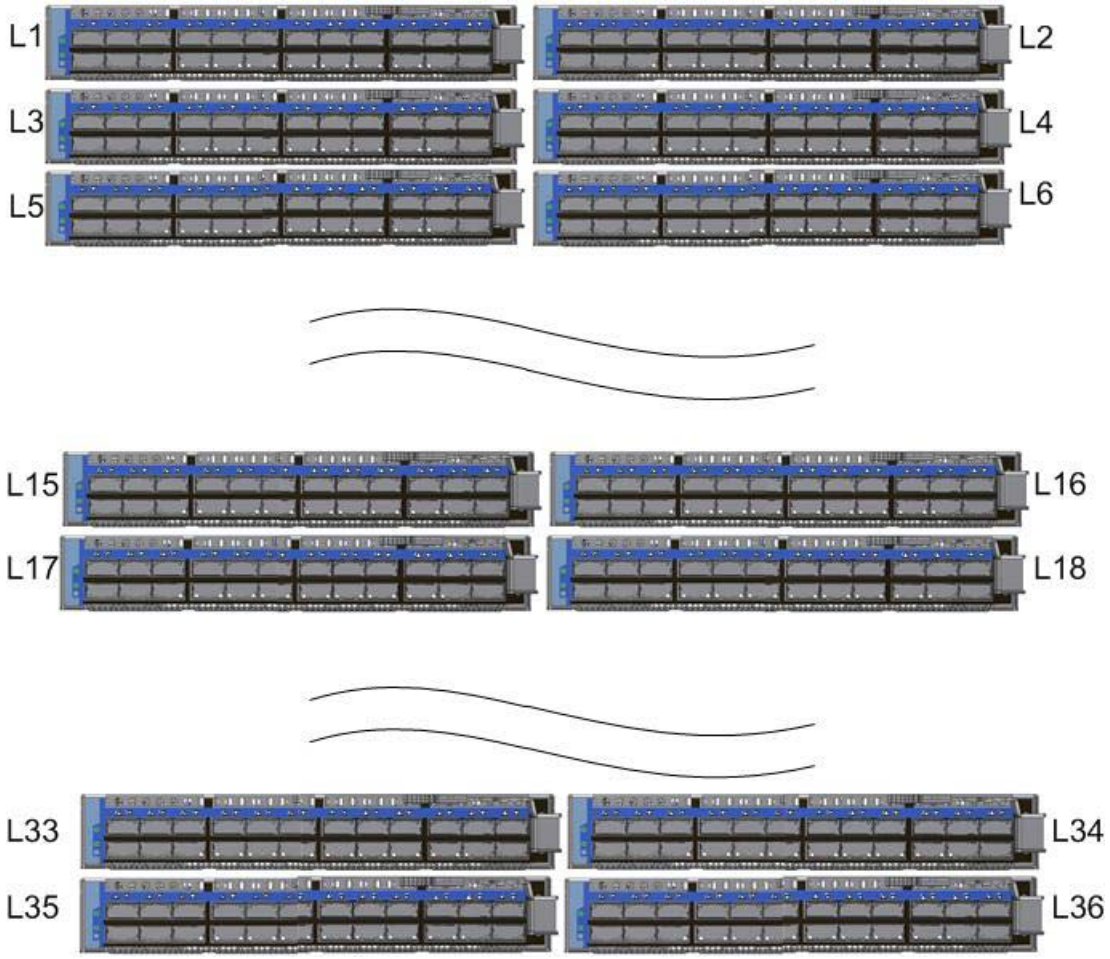


Figure 52: Leaf Board Numbering



5.2.1 Extracting a Leaf Board

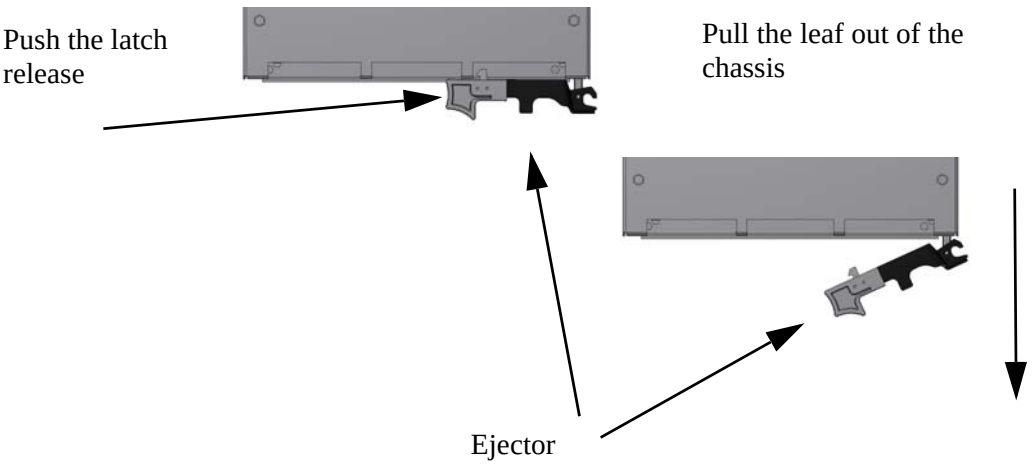
Each leaf board has an ejector that locks the board in place and serves as a lever for seating or extracting (see Figure 63).

1. Run the shut down command **"no power enable <module>".** For example to shut down leaf 16 run the command below.

```
switch-1 [Orca648: master] (config) # no power enable L16
```

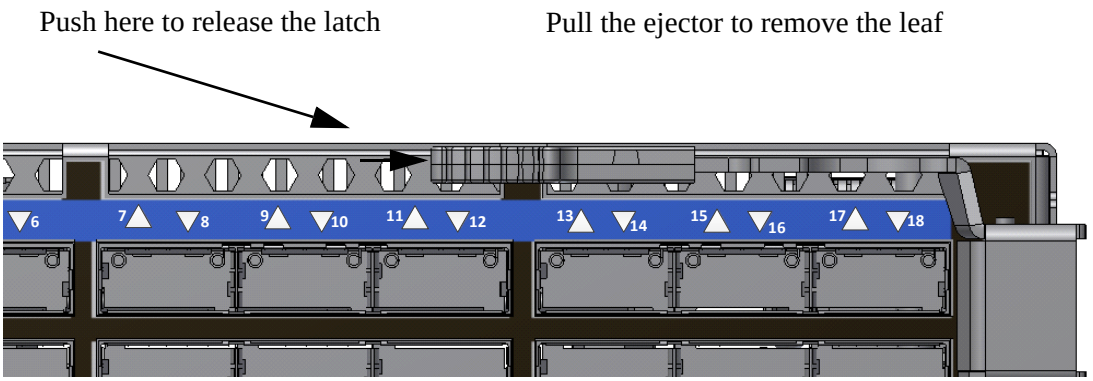
2. Disconnect all cables connected to the leaf.
3. Push the latch to unlock the ejector from the chassis.
4. Open the ejector until it is 45 degrees from the leaf.
5. Pull out on the leaf.

Figure 53: Ejector Latch



The board is short, therefore do not let go of it while sliding it out.

Figure 54: Leaf Release



5.2.2 Inserting a Leaf Board

Start with the latch fully open, that is 45 degrees to the front panel of the leaf. Carefully set the leaf board into the side guide rails and slowly slide the board into the chassis. Catch the hooks onto the vertical bar and push the latch shut.

5.3 Spine Boards

Do NOT mix replacement parts based on different generations of chip.
Do not install InfiniScale IV based replacement parts within a SwitchX® based chassis and vice versa. All Replacement modules must be consistent with the Chassis family and switch chip generation.

When hot swapping any of the units, it is necessary to wait 1 minute after removing the defective part before inserting the new part. This is necessary so that the management module will start a new cycle checking through the leafs and spines for the FW versions.

Each spine has a pair of ejectors that lock the board in place and serve as levers for seating or extracting (see Figure 56).

Management board #1 is connected to spine board #1, and management board #2 is connected to spine board #2. **When a slave management board is not installed or not working, the spine board connected to the master management board cannot be hot-swapped.** All of the spine boards can be hot-swapped when two management boards installed and working.

When more than one spine slot is empty always insert the lowest spine board first, then work your way up.

If you need to replace the bottom spine and it does not go in, try removing one or two spines above it and then insert the spines from the bottom up.

5.3.1 Extracting a Spine Board

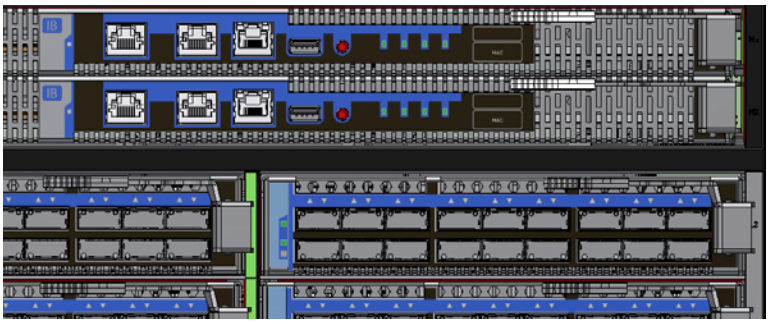
When a slave management board is not installed or not working, hot-swapping the spine board connected to the master management board will cause the chassis to crash.

Neither the CLI nor the GUI management tools will allow you to shut down spine #1 or spine #2, as the management modules are connected to the chassis components through these spines.

5.3.1.1 Extracting Spine Board #1 or #2

Spine board #1 is connected to management board #1 and spine board #2 is connected to management board #2.

Figure 55: Management Module Numbering



MNG1 management module #1 (top)

MNG2 management module #2 (bottom)

Removing spine #1 causes management module #1 to reset.
Removing spine #2 causes management module #2 to reset.

Warning: If the spine you want to hot swap is connected to the **master** management module the management module will **reboot** when you take out the spine.
If you have only one management module the chassis will crash!

Figure 56: Ejector Latch

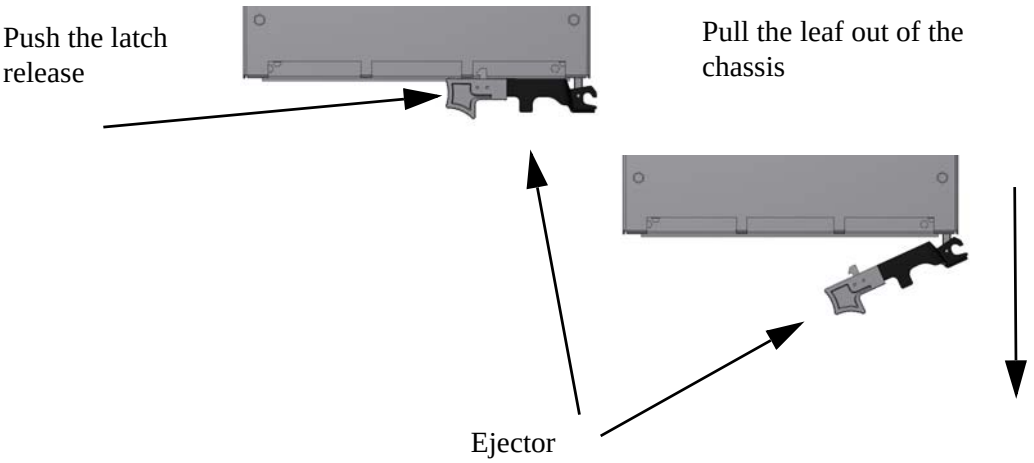
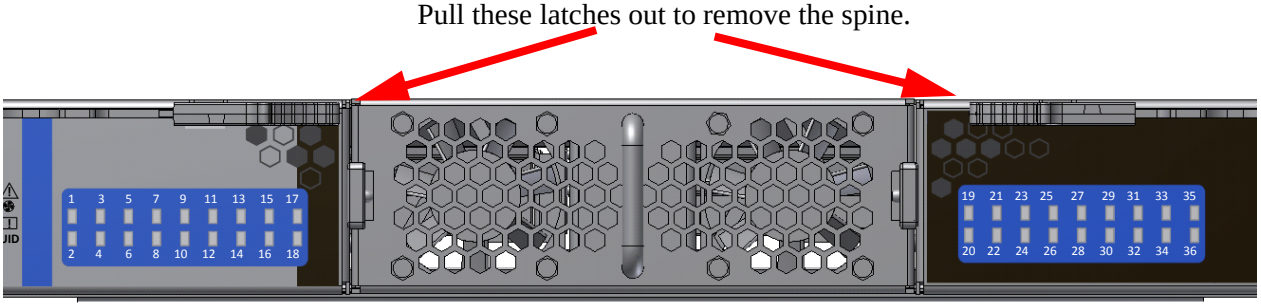


Figure 57: Spine Board Extraction



If you need to hot swap spine #1 or spine #2:

1. Check to see if the spine you need to remove is connected to the master management module. See Figure 55.

Warning: **If you have only one management module, the chassis will crash!**

2. Push outward on the latches to unlock the ejectors from the chassis.
3. Open the ejectors until they are 45 degrees from the module.
4. Pull out on the module using both ejectors.

5.3.1.2 Extracting Spine Boards Except #1 or #2

1. Run the shut down command **"no power enable <module>".** For example to shut down spine 06 run the command below.

```
switch-1 [Orca648: master] (config) # no power enable S06
```

2. Push outward on the latches to unlock the ejectors from the chassis.
3. Open the ejectors until they are 45 degrees from the module.
4. Pull out on the module using both ejectors.

5.3.2 Inserting a Spine Board

1. Start with the latches fully open, that is 45 degrees to the front panel of the leaf.
2. Hold the spine board by the sides with both latches fully open.
3. Insert the board into its rail. The board should slide in *without* resistance.
4. Push the board in until the hooks on the latches are touching the vertical bar.
5. Now press both latches inward simultaneously. You should feel the latches are hooked into the front panel.
6. Press both latches applying some force to close them completely. The locking latch will engage.

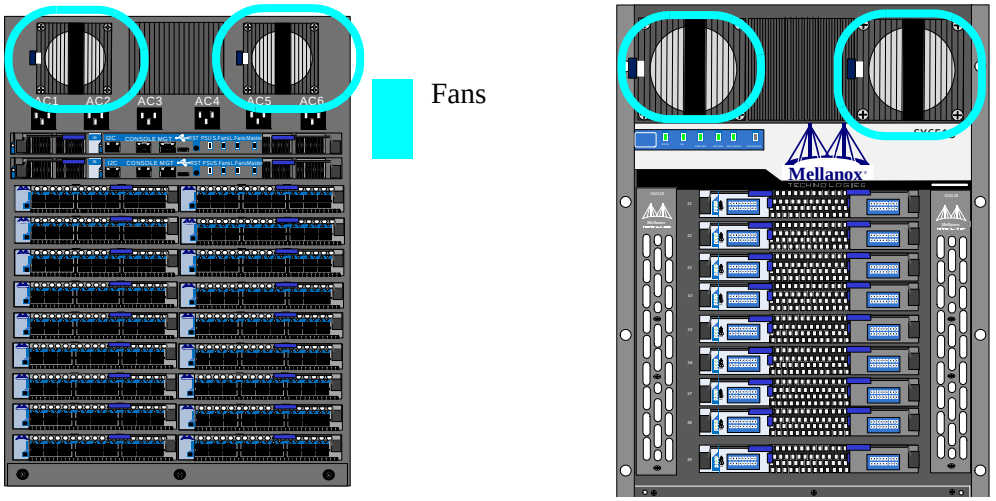
5.4 Fan Modules

There are four fan modules on the chassis for the leafs. They are located on both sides of the chassis; two on the leaf side corners and two on the spine side. When a fan module is not functioning the status LED on the fan will light up.

Each spine has an individual fan module that contains two individual fans. Should a single fan fail the Fan Status LED on the spine and the S. Fan LED on the management module will light, indicating the necessity to replace the fan module. Air flow through the spines is independent of the air flow through the leafs.

There are two different fan modules for the chassis. These fans have different model numbers and are not interchangeable. The fans on the leaf side of the chassis are MTF005001, whereas the fans on the spine side of the chassis are MTF005002.

Figure 58: Fan Locations on the Chassis



5.4.1 Leaf Fan Module

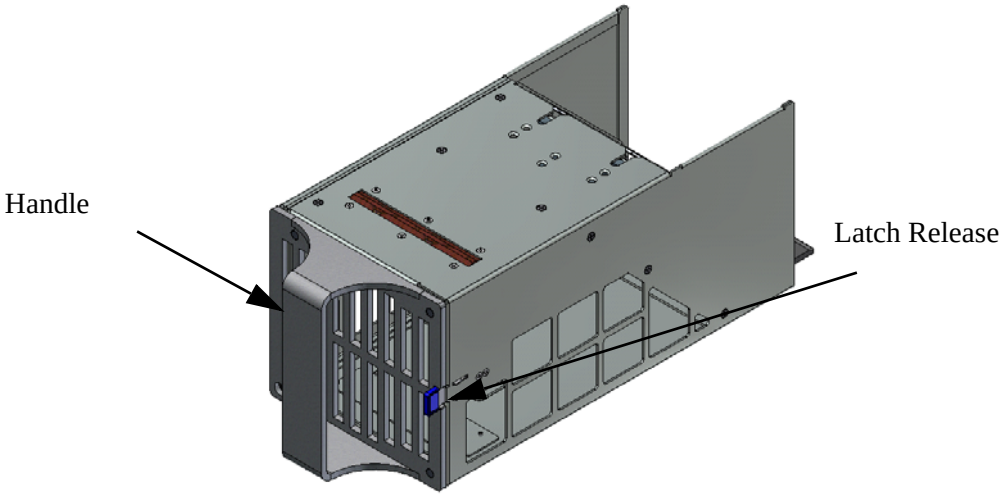
There are four leaf fan modules. Two leaf fan modules are found on the leaf side and two leaf fan modules are found on the spine side.

The leaf side fans are not interchangeable with the spine side fans. Air flow through the leafs is independent of the air flow through the spines.

5.4.1.1 Extracting the Leaf Fan Module

1. Push and hold the blue latch release. See Figure 59.
2. Slowly pull out the fan module using the handle.

Figure 59: Leaf Fan Module Extraction



5.4.1.2 Inserting the Leaf Fan Module

1. Make sure the fan module is oriented correctly top side up. Confirm that the location of the connector in the chassis will line up with the connector in the fan module.
2. Slowly slide in the new leaf fan module.

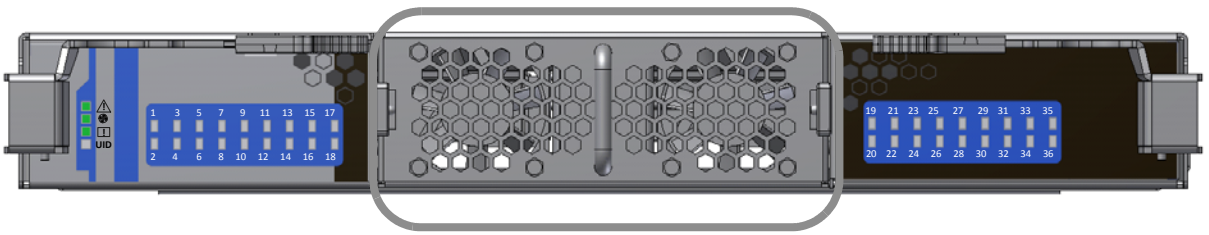
If the fan module stops before it goes in all of the way it is inserted incorrectly or it may be for the other side of the chassis!

3. Push the fan module until the latch engages.
4. Make sure that the green leaf LED on the module comes on (indicating that fan is running).

5.4.2 Spine Fan Modules

Each spine module has a fan module with two individual fans built in. When a fan module is not functioning the Fan Status LED on the spine will light up.

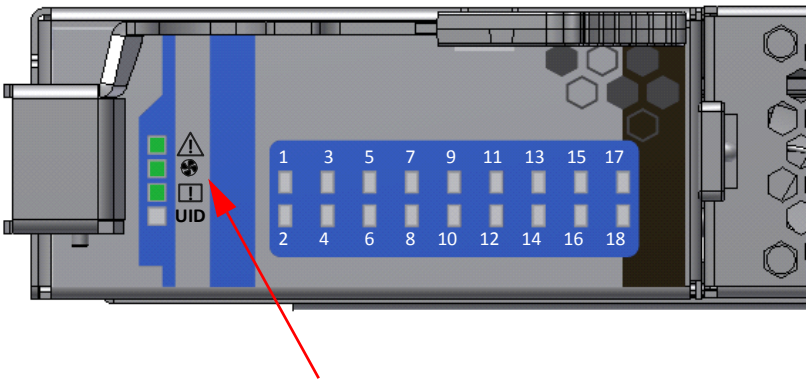
Figure 60: Spine Fan Module



Fan Module

When a fan module is removed the indicator light will reset.

Figure 61: Fan Status LED on the Spine Module



5.4.2.1 Extracting the Spine Fan Module

1. Push the two blue latch buttons together while pulling the fan module out.

5.4.2.2 Inserting the Spine Fan Module

1. Make sure the fan module is oriented correctly top side up. Confirm that the location of the connector in the chassis will line up with the connector in the fan module.
2. Slowly slide in the new spine fan module.
3. Push the fan module as far as it will go, make sure the locking latches engage.

If the Fan LED continues to show red remove the fan module and check the pins on the connector inside if the spine to make sure that none of them are bent.

5.5 Management Module

When hot-swapping any of the units, it is necessary to wait 1 minute after removing the defective part before inserting the new part. This is necessary so that the management module will start a new cycle checking through the leafs and spines for the FW versions.

Before starting any procedure on the SX6518 series switch system put an ESD prevention wrist strap on your wrist and connect to the SX6518 series chassis.

5.5.1 Extracting a Management Module

Management modules are located on the leaf side, above the leafs. There are two places to install the management modules.

Only one management module is required to run the switch system.

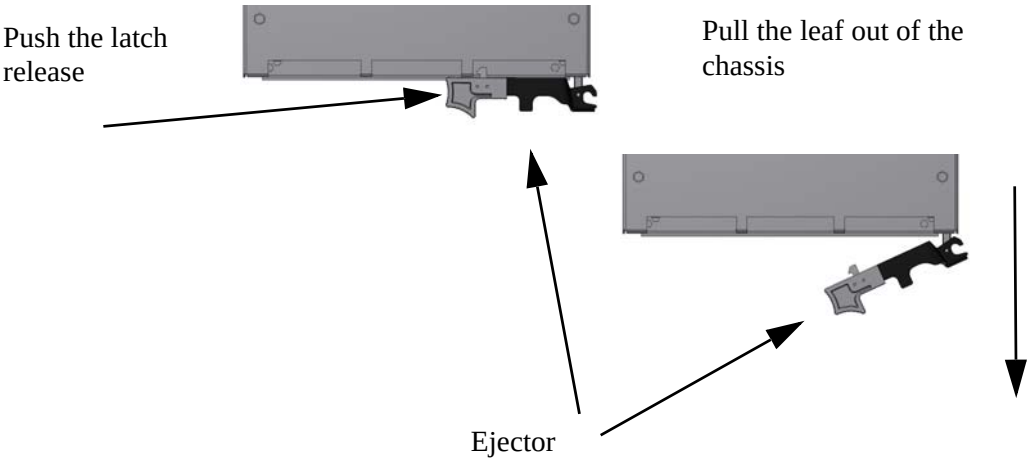
Each management module has a pair of ejectors that lock the board in place and serve as a lever for seating or extracting (see Figure 63).

1. Run the shut down command **"no power enable <module>".** For example to shut down management module 2 run the command below.

```
switch-1 [Orca648: master] (config) # no power enable MGMT2
```

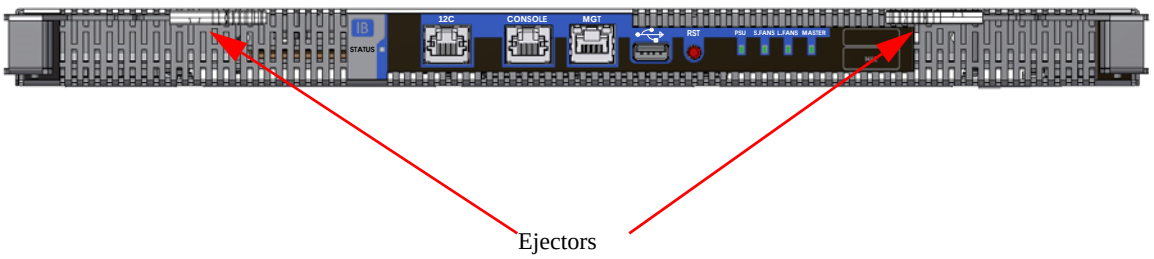
2. Disconnect all cables connected to the management module.
3. Push outward on the latches to unlock the ejectors from the chassis.
4. Open the ejectors until they are 45 degrees from the module.
5. Pull out on the module using both ejectors.

Figure 62: Ejector Latch



The board is short, therefore do not let go of it while sliding it out.

Figure 63: Management Module



5.5.2 Inserting a Management Module

1. Start with the latch fully open, that is 45 degrees to the front panel of the leaf.

2. Carefully seat the management module into the slot and slowly slide the board into the chassis until the ejectors begin to engage on the chassis edge.
3. Press the ejectors inward until the locks snap. This indicates that the board is fully seated.
4. Perform the initial configuration on the management module. See the Installation Guide.

On switch systems with dual management systems, first connect the cable and configure the master management module CPU and only then configure the slave. By default the master CPU is the top management module. For further information on the master and slave roles, see the MLNX-OS™ Software UM section “High Availability”.

All management modules in the chassis must go through an initial configuration procedure. See the Installation Guide for the initial configuration procedure.

5.6 Switch Shut Down Procedures

To shut down the chassis run the following command twice (once for each MM):

```
Reload halt [noconfirm]
```

The chassis cannot be restarted remotely!
To restart the chassis you must physically go to the switch and unplug all of the power cords to the chassis and then replug in all of the power cords to the chassis.

The first time you run the command it shuts down the master management module and the second time shuts down the slave management module.

To shut down a leaf run the following command:

```
no power enable <module>
```

To shut down a spine run the following command:

```
no power enable <module>
```

To shut down a management module run the following command:

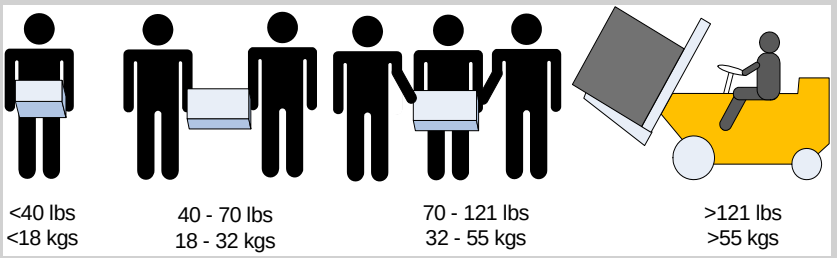
```
no power enable <module>
```

6 Disassembly and Disposal

6.1 Disassembling the Chassis

1. Power down the chassis.
2. Remove all power cables.
3. Remove all connector cables.
4. Disconnect the ground lug from the ground post.
5. Remove all leafs.
6. Remove all spines.
7. Remove all management modules.

Use enough people to safely lift this product.



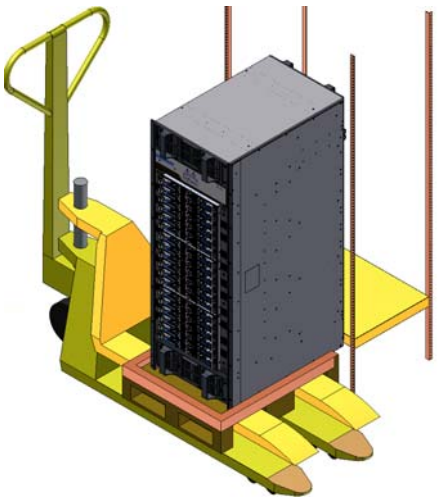
This product and all of its parts are NOT to be disposed of with household waste. This product contains printed circuit boards cables and batteries. According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and disposed of according to the directive.

8. Go to the Mellanox website for detailed instructions for disassembly of the FRUs and chassis according to the WEEE Directive.
9. Dispose of these pieces in a legal and environmentally friendly way.

6.1.1 Removing the Chassis

1. Remove the screws connecting the upper brackets to the rack.
2. Remove the screws holding the chassis to the rack. These screws are located in the faceplate on the spine side of the chassis.
3. Remove the upper brackets from the chassis.

Figure 64: Mechanical Lifting Device

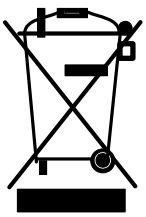


4. Put the container base (saved from the installation) on the fork lift.
5. Raise the container base to 1 cm below the level of the shelf.
6. Move the chassis away from the rack and onto the container base.
7. Put wedges around the chassis to prevent the chassis from rolling off of the container base.
8. Move the chassis away from the rack.
9. Dispose of the Chassis in a legal and environmental way.
10. Go to the Mellanox website for detailed instructions for disassembly of the chassis according to the WEEE Directive.

6.1.2 Removing the Bottom Shelf

1. Remove all of the bolts that are holding the shelf to the rack.
2. Remove the shelf.
3. Remove all of the caged nuts.

6.2 Disposal



According to the WEEE Directive 2002/96/EC, all waste electrical and electronic equipment (EEE) should be collected separately and not disposed of with regular household waste.

Dispose of this product and all of its parts in a responsible and environmentally friendly way.

Go to the Mellanox website for detailed instructions for disassembly according to the WEEE Directive.

7 Switch Management Tools

This chapter describes the management module and tools available for Out-of-Band management of the switch system via MLNX-OS.

There are 2 Ethernet ports (1 for each management module) that get connected to Ethernet switches. These switches must be configured to 10/100M auto-negotiation.

The SX6518 switch comes standard with a management software module for chassis management called Mellanox Operating System (MLNX-OS). MLNX-OS is installed on all SwitchX® based managed switch systems management modules. MLNX-OS includes a CLI, WebUI, SNMP, and chassis management features for software and IB management software (OpenSM).

You can get more information via the Mellanox MLNX-OS™ SwitchX® Software WebUI User's Manual or the Mellanox MLNX-OS™ SwitchX® Software User Manual.

The managed switch system includes the following software components:

- Embedded Subnet Manager (SM)
- Chassis manager and system BIST
- SNMP agent, 3rd party tool integration
- GUI
- Remote logging
- SSH/telnet
- Secured access in-band and out-band
- IPv4/IPv6 network stack

The chassis manager will give the user access to:

- Switch temperatures
- Power supply voltages
- Fan unit information
- Power unit information
- Flash memory
- Monitoring of:
  - AC power to the PSUs
  - DC power out from the PSUs
  - chassis failures
- querying for:
  - switch serial numbers
  - revisions
  - software version
  - SwitchX® FW version
  - switch temperatures

The manager also has the ability to burn new firmware and upgrade software on the switch.

7.1 InfiniBand Subnet Manager

The InfiniBand Subnet Manager (SM) is a centralized entity running in the switch. It discovers and configures all the InfiniBand fabric devices to enable traffic flow between those devices. The SM applies network traffic related configurations such as QoS, routing, partitioning to the fabric devices.

You can view and configure the Subnet Parameters (SM) via the CLI/WebUI.

Each InfiniBand subnet needs one subnet manager to discover, activate and manage the subnet. An InfiniBand® network requires a Subnet Manager to be running in either the Infiniband switch itself (switch based) or on one of the nodes which is connected to the Infiniband fabric (host based).

7.2 Fabric Inspector (Diagnostics)

Fabric Inspector is a plug & play software for fee within MLNX-OS displaying and filtering all identified systems and nodes within the fabric.

Fabric Inspector includes a complete set of tools for fabric wide diagnostics to check node-node and node-switch connectivity and to verify routes within the fabric.

Advanced filtering allows creating filtering rules on a system wide basis, between nodes or port connections based on traffic patterns and user assigned system names (GUIDs).

7.3 Accessing the CPU via the Ethernet Connector

Once the initial configuration is completed the management tools can be accessed through:

- SSH
- Telnet
- WEB
- SNMP
- XML

7.4 Upgrading Software

The new software and firmware update is available to the user from the Mellanox Support website. Copy the update to a known location on a Remote server within your LAN.

Use the CLI or the GUI in order to perform the Software upgrade. For further information please refer to the Mellanox-OS user manual.

If Mellanox-OS is updated and the FW image in the leafs and spines of the chassis is an earlier version than the minimum that the new version of the software can work with, then the chassis management system may require up to ~45 minutes to update all of the FW images in all of the leafs and spines.

8 TroubleShooting

8.1 Power Supply Unit

If the Power supplies cannot supply enough power the management module may shut down the system.

As each PSU is plugged in, make sure that the green power LEDs on the PSU comes on.

If the AC power LED is off:

1. Check that the power cable is the correct power cable for your country.
2. Check that the power cable is plugged into a working outlet.
3. Check that the power cable has a voltage within the range of 100 - 240 volts AC.
4. Remove and reinstall the power cable.
5. Check the circuit breakers to be sure that the breaker has not tripped.
6. Check that the power cable is good. Replace the power cable.
7. If the AC power LED is green but the OK power LED is off or the FAIL LED is on – Replace the PSU.

8.2 Leaf Board

The power LED for the Leaf board is off:

1. Make sure that all of the PSUs are showing DC OK.
2. Uninstall and reinstall the Leaf board.
3. When the Yellow LED is on, this indicates a fault in the board, uninstall and reinstall the Leaf board.
4. If uninstalling and reinstalling the Leaf board does not work, burn the latest FW on the Leaf board and uninstall and reinstall the Leaf board.
5. Replace the Leaf board with a new one.

Should any of the boards shut down due to over temperature, wait 5 minutes and then follow the procedure starting with step 2

The Physical link LED for the InfiniBand connector does not come on:

1. Check that both ends of the cable are connected.
2. Check that the locks on the ends are secured.
3. Make sure that the latest FW version is installed on both the HCA card and the switch.
4. If media adapters are used check that the all connections are good, tight, and secure.
5. Replace the cable.

The Activity indication does not come on:

Check that the Subnet Manager has been started.

8.3 Management Module

8.3.1 Yellow Status LED for the Chassis on the Management Module is Lit

1. Check the MLNX-OS management for confirmation and possible explanation of the alert.
2. Reset the master management module by pushing the rest button. If you have two management modules installed this will convert the master management module to the slave and convert the slave to the master.

If there is only one management module in the chassis all of the leafs and ports are reset by bringing them down and powering them up when the management module is removed.

3. Make sure the S.Fans and L.Fans LEDs are green.
4. Make sure that the spine and the leafs both have the same version of FW.
5. Reburn the FW and remove and reinstall the management module.
6. If you are running the chassis with only one management module, remove and reinstall the management module. Make sure the mating connectors of the unit are free of any dirt and/or obstacles. See Section 5.5 on page 75.
7. If you are running the chassis with only one management module, replace the management module.

8.3.2 Yellow LED for the Leaf Fan on the Management Module is Lit

1. Check the MLNX-OS management for confirmation and possible explanation of the alert.
2. Make sure that there is nothing blocking the front or rear of the chassis and that the fan modules and ventilation holes are not blocked (especially dust over the holes).
3. If you find dust blocking the holes it is recommended to clean the fan unit and remove the dust from the front and rear panels of the switch using a vacuum cleaner.
4. Determine which fan module is problematic by checking the status LED on each fan module.
5. Remove and reinstall the problematic fan unit. Make sure the mating connector of the new unit is free of any dirt and/or obstacles. See Section 5.4 on page 72.
6. Replace the Leaf fan module.

There are two non-interchangeable types of leaf fan modules. If the new leaf fan does not go into the chassis confirm that it is the correct fan module.

Replace defective leaf fan modules as soon as they are identified.

Should any of the boards shut down due to over temperature, follow the procedure starting in step 2

8.3.3 Yellow LED for the Spine Fan on the Management Module is Lit

1. Check the MLNX-OS management for confirmation and possible explanation of the alert.
2. Determine which spine has a defective fan by checking the Fan LEDs on all of the spines.
3. Make sure that there is nothing blocking the front or rear of the chassis and that the fan modules and ventilation holes are not blocked (especially dust over the holes).
4. If you find dust blocking the holes it is recommended to clean the fan unit and remove the dust from the front and rear panels of the switch using a vacuum cleaner.
5. Remove and reinstall the fan unit of the spine. Make sure the mating connector of the new unit is free of any dirt and/or obstacles. See Section 5.4 on page 72.
6. Replace the spine fan module.

Replace defective spine fan modules as soon as they are identified.

8.4 Spine Board

The yellow LED on the Spine board is lit:

1. Check the MLNX-OS management for confirmation and possible explanation of the alert.
2. Make sure that there is nothing blocking the front or rear of the chassis and that the fan modules and ventilation holes are not blocked (especially dust over the holes).
3. If you find dust blocking the holes it is recommended to clean the fan unit and remove the dust from the front and rear panels of the switch using a vacuum cleaner.
4. Remove and reinstall the spine board. Make sure the mating connectors of the unit is free of any dirt and/or obstacles. See Section 5.3 on page 70.
5. Make sure that the spine and the Leafs both have the same version of FW.
6. Reburn the FW and remove and reinstall the spine.
7. Replace the spine board.

8.5 MLNX-OS™ Software

The last software update did not succeed:

1. Connect the RS232 connector (CONSOLE) to a laptop.
2. Push the reset button on the switch or management module.
3. You will have ~ 5 seconds to stop the U-Boot by pressing Control-B.
4. Choose the image to upload. Only use image 1 or image 2.

```
U-Boot 2009.01-mlnx1.4 (May 12 2010 - 14:08:15)


CPU:   AMCC PowerPC 460EX Rev. A at 1000 MHz (PLB=200, OPB=100,
       EBC=100 MHz)
       Security/Kasumi support
       Bootstrap Option H - Boot ROM Location I2C (Addr 0x52)
       Internal PCI arbiter disabled
       32 kB I-Cache 32 kB D-Cache
Board: Mellanox PPC460EX Board
FDEF:  No
I2C:   ready
DRAM:   2 GB (ECC enabled, 400 MHz, CL3)
FLASH: 16 MB
NAND:  1024 MiB
PCI:   Bus Dev VenId DevId Class Int
PCIE0: link is not up.
PCIE1: successfully set as root-complex
        01  00  15b3  bd34  0c06  00
Net:   ppc_4xx_eth0, ppc_4xx_eth1
Hit Ctrl+B to stop autoboot:  0


Mellanox FabricIT


Boot Menu:
  1. EFM_PPC_M460EX EFM_1.1.1000 2010-06-24 16:32:03 ppc
  2. EFM_PPC_M460EX EFM_1.1.1200  2010-06-25  18 :00:03 ppc
  3. U-Boot prompt
  Choice:
```

5. Select the image to boot.

For more detailed instructions concerning MLNX-OS™ software see the Mellanox MLNX-OS™ SwitchX® Software WebUI User's Manual or the Mellanox MLNX-OS™ SwitchX® Software User Manual.

Appendix A: Specification Data

Table 14 - Switch Specification Sheet SX6518

Physical				
Size / Mounting	Size:	28” x 19” x 27” inches 711 mm x 482.6mm x 685 mm The shelf adds 66.7mm to the height	Mounting:	19” Rack mount
Weight / Center of Gravity	Weight:	212.36 kg (468 LBS) full configuration 90 kg (199 LBS) empty configuration 112 kg (247LBS) As shipped configuration	Center of Gravity: Measured from the bottom left corner as one faces the switch ports.	CoGh 311.8 (mm from bottom of chassis) CoGw 222 (mm from left side surface) CoGd 328.14(mm from port end surface)
Air Flow	Max. Air Flow Through leafs:	16.59M3/min. (585.9 CFM)	Max. Air Flow Through spines:	9.48 M3/min. (334.8 CFM)
SerDes Speeds / Connector Types	SerDes Speeds:	10, 20, 40,Gb/s or 56,Gb/s per port	Connector Types:	QSFP
Sound Level / Ports	Sound Level	76 db(A)	Ports	324 ports
Power and Environmental				
Input Voltage / Management	Input Voltage:	100 - 240 VAC 50-60Hz	Management CPU:	PowerPC 460EX
Power numbers	Total Power Consumption:	Typical FDR14 Passive cables: 3718W Typical FDR14 Active cables: 4556W (including QSFP at 1.5W) Max FDR14 Passive cables: 3911W Max FDR14 Active cables: 4897W (including QSFP at 2.0W)	Power Consumption Leaf:	Typical:109.5W (not including QSFP power) Max: 111.4W (not including QSFP power)
	Power Consumption Spine:	Typical: 130W (include 2 Fans) Max:136W (include 2 Fans)	Max Heat Output: Power Consumption for Active cables	16, 709 BTUs/hr 2.0W MAX Power level #2
Temperature	Operating	0° to 45° Celsius	Non-operating	-40° to 70° Celsius
Cable power / Humidity	QSFP:	MAX 2W TYP: 1.5W	Humidity: Operating	5% - 95% non-condensing

Protocol Support				
Speed protocol / Management	InfiniBand:	Auto-Negotiation of (56Gb/s,40Gb/s, 20Gb/s, 10Gb/s)	Management:	Managed using MLNX-OS Baseboard, Performance, and Device management Agents for full Infini-Band In-Band Management
Data Rate / QoS	Data Rate:	56Gb/s per port	QoS	8 InfiniBand Virtual Lanes for all ports
Regulatory Compliance				
Safety / EMC (Emissions)	Safety:	US/Canada: cTUVus EU: IEC60950 International: CB Russia: GOST-R Argentina: S-mark China: CCC for power supply Korea: KN22:2209; KN24:2009	EMC (Emissions):	USA: FCC, Class A Canada: ICES, Class A EU: EN55022, Class A EU: EN55024, Class A EU: EN61000-3-2, Class A EU: EN61000-3-3, Class A Japan: VCCI, Class A Australia C-Tick
Environmental / Vibration /	Environmental:	EU: IEC 60068-2-64: Random	Vibration:	EU: IEC 60068-2-29: Shocks, Type I / II EU: IEC 60068-2-32: Fall Test
Acoustic / Shock and Vibration:	Acoustic:	76DbA ISO 7779 ETS 300 753	Shock and Vibration:	ETSI EN 300 019-2-2: 1999-09
Scalability and Performance				
Switching Performance / Capacity	Leafs:	Up to 18 leafs; 18-ports each	Power Supplies:	6 Power Supplies standard
	Spines:	9 spine boards All spines are needed for non-blocking configuration	Management Modules:	2 available 1 required for operation
	Addressing:	48K Unicast Addresses Max. per Subnet 16K Multicast Addresses per Subnet	Leaf fans:	4
	Switching Capacity:	36.25Tb/s	Switching Performance:	Simultaneous wire-speed any port to any port

A.1 EMI Certification

EMI certification on the fully populated chassis was performed with the chassis installed in a closed two-door rack using the chassis installation kit supplied by Mellanox Technologies.

A.2 Approved Cables

For a list of all approved cables see:

http://www.mellanox.com/related-docs/user_manuals/Mellanox_approved_cables.pdf

A.3 EMC Certifications

The list of approved certifications per chassis in different regions of the world is located on the Mellanox Website at:

http://www.mellanox.com/related-docs/user_manuals/Regulatory_and_Compliance_Guide.pdf

EMC Statements are also in the Regulatory and Compliance Guide.

Appendix B: Thermal Threshold Definitions

There are three thermal threshold definitions for the SwitchX® switch device which impact the overall switch system operation state: Warning, Critical and Emergency.

1. Warning – 100^{o}C

On managed systems only: When the SwitchX® device crosses the 100^{o}C threshold, a Warning Threshold message will be issued by the MLNX-OS management SW, indicating to system administration that the switch has crossed the Warning threshold.

Note that this temperature threshold does not require nor lead to any action by hardware (such as switch shutdown).

2. Critical – 120^{o}C

When the SwitchX® device crosses this temperature, the firmware will automatically shut down the device.

3. Emergency – 130^{o}C

In case the firmware fails to shut down the SwitchX® device upon crossing the Critical threshold, the SwitchX® device will auto-shutdown upon crossing the Emergency (130^{o}C) threshold.

Appendix C: Calculating the Weight of a Customized Chassis

The weight of a customized chassis can be calculated for any possible customization as follows.

Take the weight of a chassis with the following FRUs installed.

- All fans modules
- All power supplies

The weight of the SX6518 chassis configured above is 112kg.

To this add the weight of installed FRUs.

- Spines
- Leafs
- Leaf blanks
- Management modules

Fill in the table below to calculate the weight of your system.

Number of FRUs	FRU Type	Weight of 1 FRU	Total Weight / FRU Type
	Chassis as shipped		
	# of Spines *	3.77 =	
	# of leafs *	2.76 =	
	# of leaf blanks *	0.764 =	
	# of management modules *	3.15 =	
	Total	=	

This total is in kilograms. Multiply the total by 2.2 to get the total weight in pounds.

Appendix D: Calculating the Power of a Chassis

To calculate the power consumption of a chassis take the base power and add the power of the fans, spines, management modules, and leafs.

Table 15 - Power Consumption of Chassis Parts

Part	Typ Power Passive Cables	Typ Power Active Cables @ 2w Per Port
IB FDR leaf	91W	125
Spine	108W	Not applicable
Fan	117W	Not applicable
Management Module	14W	Not applicable

To calculate the chassis power at typical conditions fill in the table below.

Number of FRUs	FRU Type	Typ Power of 1 FRU	Total Power / FRU Type
	# of Spines *	108	
	# of leafs (passive cables)*	91	
	# of leafs (active cables)*	125	
	# of management modules * for the PC 460 management module	14	
	Chassis Fans	15	
	Total not including Power efficiency of 85%		
	Total / 0.85		

Divide the total by 0.85; the power supply efficiency.

Appendix E: QSFP Interface

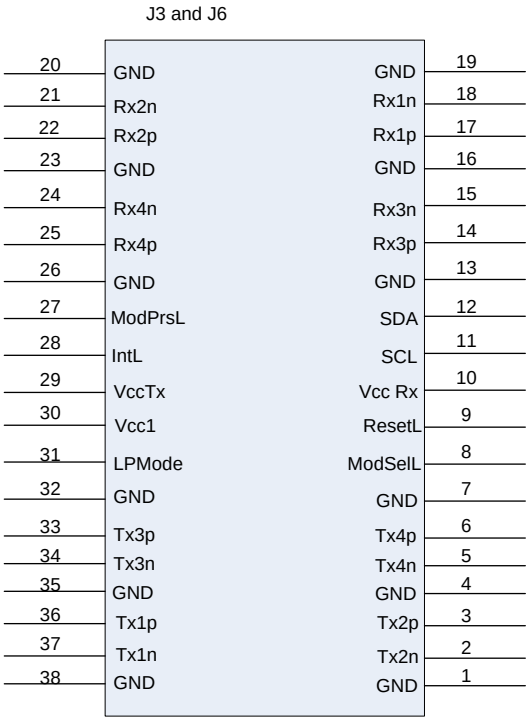
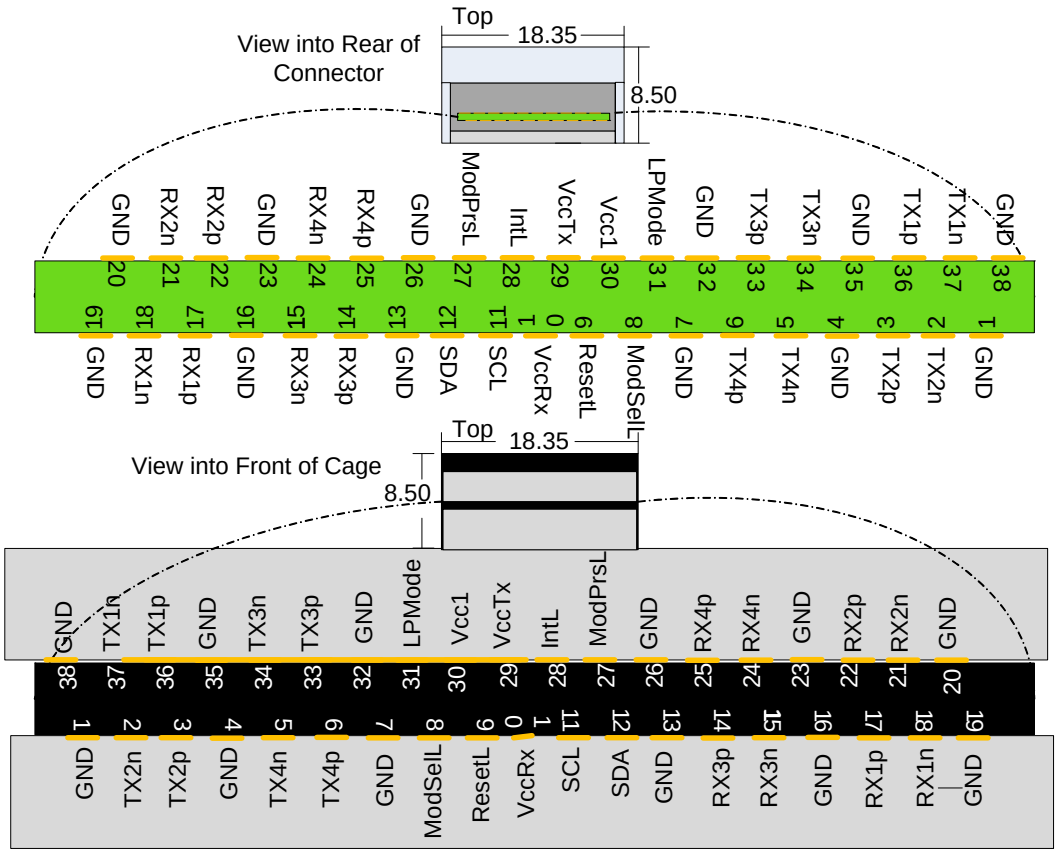


Table 16 - InfiniBand QSFP Connector Pinout

Connector Pin Number	Connector Pin Name	Signal Description
1	GND	Ground
2	Tx2n	Transmitter Inverted Data Input
3	Tx2p	Transmitter Non-Inverted Data Input
4	GND	Ground
5	Tx4n	Transmitter Inverted Data Input
6	Tx4p	Transmitter Non-Inverted Data Input
7	GND	Ground
8	ModSelL	Module Select
9	ResetL	Module Reset
10	Vcc Rx	+3.3 V Power supply receiver
11	SCL	2-wire serial interface clock
12	SDA	2-wire serial interface data
13	GND	Ground
14	Rx3p	Receiver Non-Inverted Data Output
15	Rx3n	Receiver Inverted Data Output
16	GND	Ground
17	Rx1p	Receiver Non-Inverted Data Output
18	Rx1n	Receiver Inverted Data Output
19	GND	Ground
20	GND	Ground
21	Rx2n	Receiver Inverted Data Output 3
22	Rx2p	Receiver Non-Inverted Data Output 3
23	GND	Ground
24	Rx4n	Receiver Inverted Data Output 3
25	Rx4p	Receiver Non-Inverted Data Output 3
26	GND	Ground
27	ModPrsL	Module Present
28	IntL	Interrupt
29	Vcc Tx	+3.3 V Power supply transmitter
30	Vcc 1	+3.3 V Power Supply
31	LPMode	Low Power Mode
32	GND	Ground
	Tx3p	Transmitter Non-Inverted Data

Figure 65: QSFP Connector Male and Female Views


Top
View into Rear of Connector
18.35
8.50
GND RX2n RX2p GND RX4n RX4p GND ModPrsL IntL VccTx Vcc1 LPMode GND TX3p TX3n GND TX1p TX1n GND
20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38
19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1
GND RX1n RX1p GND RX3n RX3p GND SDA SCL VccRx ResetL ModSelL GND TX4p TX4n GND TX2p TX2n GND
Top
View into Front of Cage
18.35
8.50
GND TX1n TX1p GND TX3n TX3p GND LPMode Vcc1 VccTx IntL ModPrsL GND RX4p RX4n GND RX2p RX2n GND
38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
GND TX2n TX2p GND TX4n TX4p GND ModSelL ResetL VccRx SCL SDA GND RX3p RX3n GND RX1p RX1n GND

Appendix F: Replacement Parts Ordering Numbers

Table 17 - Replacement Parts Ordering Numbers

Part Description	OPN
Power supply unit PSU 1000W for Modular Switch Family	MTP005001
Power Supply unit PSU 1600W for Modular Switch Family	MTP006002
Power supply blank	MTM005001
Leaf board unit 18 port FDR	MSX6001FR
Leaf board unit 18 port FDR-10	MSX6001TR
Modular Switch Family, Leaf - Blank	MTM005004
Spine board unit for FDR system	MSX6002FLR
Spine board unit for FDR10/QDR system	MSX6002TBR
Spine board blank	MTM005002
PPC460 Management Module	MSX6000MAR
x86 Management Module	MSX6000MBR
Modular Switch Family, Management - Blank	MTM005003
Rack Installation Kit for IS5600/SX6536 Series	MTR005600
Cable Management Device Set for IS5600/SX6536	MTR005601
Cables Set For IS5600/SX6536 Series	MTR005602
IS5600/SX6536, IS5300/SX6518 Series Modular Switch, leaf cooling chassis fan unit located on Leaf Side	MTF005001
IS5600/SX6536, IS5300/SX6518 Modular Switch, leaf cooling chassis fan unit located on Spine Side	MTF005002
SX6536, SX6518, MSX6512,MSX 6506 Modular Switch Series Spine Fan Unit	MTF005005
DB9 to RJ45 Harness	HAR000028
Power cord 250V 15A 2.0M C14 to C13	ACC000334
Power cord 125V 15A 2.0M C14 TO C13	ACC000242
Power cord Type B for USA, Canada, Mexico, Taiwan	ACC000204
Power cord Type H for Israel	ACC000205
Power cord Type E/F for Sweden, France, Germany, Netherlands, Russia	ACC000207

Table 17 - Replacement Parts Ordering Numbers (Continued)

Part Description	OPN
Power cord Type G for UK	ACC000208
Power cord Type D for India	ACC000209
Power cord Type I for China	ACC000210
Power cord Type J for Switzerland	ACC000211
Power cord Type B for Japan	ACC000212
Power cord Type I for Australia	ACC000213

Appendix G: Avertissements de sécurité d'installation (French)

1. Instructions d'installation

Lisez toutes les instructions d'installation avant de brancher le matériel à la source d'alimentation électrique.

2. Température excessive

Ce matériel ne doit pas fonctionner dans une zone avec une température ambiante dépassant le maximum recommandé de 45°C (113°F). Un flux d'air de 200LFM à cette température ambiante maximale est nécessaire. En outre, pour garantir un bon écoulement de l'air, laissez au moins 8 cm (3 pouces) d'espace libre autour des ouvertures de ventilation.

3. Empilage du châssis

Le châssis ne doit pas être empilé sur un autre matériel. Si le châssis tombe, il peut provoquer des blessures corporelles et des dégradations de biens.

4. Connection d'Alimentation electrique excedentaire -dangers électriques

Ce produit comporte un couvercle transparent sur l'espace pour l'alimentation électrique redondante.
Ne pas faire fonctionner le produit si le couvercle transparent n'est pas solidement fixé ou s'il est enlevé.

5. Système de fusible neutre/à double pôle

Avertissement: Système de fusible neutre/à double pôle. Veuillez debrancher tous les cordons d'alimentation avant d'ouvrir le boitier de ce produit ou de toucher un de ses composants internes.

6. Orages – dangers électriques

Pendant un orage, il ne faut pas utiliser le matériel et il ne faut pas brancher ou débrancher les câbles.

7. Branchement/débranchement des câbles InfiniBand en cuivre

Les câbles InfiniBand en cuivre sont lourds et ne sont pas flexibles, il faut donc faire très attention en les branchant et en les débranchant des connecteurs. Consultez le fabricant des câbles pour connaître les mises en garde et les instructions spéciales.

8. Risque de choc et de danger

Risque de choc et de danger
e’lectriques. Le de’branchment d’une seule alimentation stabilise’e ne de’branch uniquement qu’un module “Alimentation Stabilise’e”. Pour isoler completement le module en cause, Il faut de’brancher toutes les alimentations stabilise’es

Risk of electric shock and energy hazard.
The PSUs are all independent.
Disconnect all power supplies to ensure a powered down state inside of the switch platform.

9. Montage et entretien sur baie

Lorsque ce produit est monté ou entretenu sur baie, il faut prendre des précautions spéciales pour s’assurer que le système reste stable. En général, il faut remplir la baie avec du matériel de bas en haut.

10. Fuite>3.5mA Leakage >3.5mA

« ATTENTION – La connexion à la terre des forts courants de fuite est essentielle avant le branchement de l’alimentation. »
Avant de brancher l’appareil à la conduite d’alimentation, les vis de protection à la terre du terminal de l’appareil doivent être appliquées à l’installation de protection à la Terre du bâtiment.

11. Forts Courants de Fuite High Leakage Current

Attention: Forts courants de fuite. Il est essentiel de relier a la terre avant de brancher l'alimentation.

12. Ajouter une information de connexion à la masse Connect a Valid Ground to this Device

Avant de brancher l’appareil à la conduite d’alimentation, les vis de protection à la terre du terminal de l’appareil doivent être appliquées à l’installation de protection à la Terre du bâtiment.

13. Installation du matériel

Ce matériel ne doit être installé, remplacé ou entretenu que par du personnel formé et qualifié.

14. Elimination du matériel

L’élimination de ce matériel doit s’effectuer dans le respect de toutes les législations et réglementations nationales en vigueur.

15. Codes électriques locaux et nationaux

Ce matériel doit être installé dans le respect des codes électriques locaux et nationaux.

16. Codes d'installation

L'appareil doit être installé selon l'ancienne version des codes électriques nationaux du pays. Pour l'Amérique du Nord, l'équipement doit être installé conformément aux spécifications du Code Electrique National Américain et du Code Electrique Canadien.

17. Interconnexion des unites

Les câbles de branchement à l'unité RS232 et les interfaces Ethernet doivent être certifiés UL de type DP-1 ou DP-2. (Note - lorsqu'il existe dans un circuit non LPS)

Protection contre la surintensité : Un appareil de protection répertorié facilement accessible contre la surintensité du circuit de branchement et calibré à 20A doit être incorporé dans le câblage électrique du bâtiment.

18. Exposition au rayonnement grave

Mise en garde – l'utilisation de commandes ou de réglages ou l'exécution de procédures autres que ce qui est spécifié dans les présentes peut engendrer une exposition au rayonnement grave.

PRODUIT LASER DE CLASSE 1 » et références aux normes laser les plus récentes CEI 60 825-1:1993 + A1:1997 + A2:2001 et NE 60825-1:1994+A1:1996+ A2:2001

19. S'assurer que les enceintes sont appropriées

Des enceintes électriques, mécaniques et incendie adaptées doivent être fournies par le fabricant du produit final ou par l'utilisateur final.

20. Cordons électriques CA homologués UL

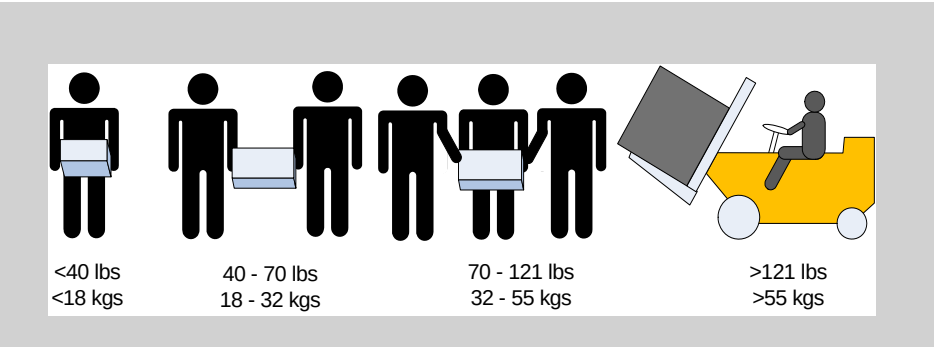
Pour les prises électriques en Amérique du Nord, choisissez un cordon électrique homologué UL et certifié CSA

à 3 conducteurs, [18 AWG], terminé par une fiche moulée, d'une tension nominale de 125 V, [15 A], avec une longueur minimale de 1,5 m [6 pieds] et d'une longueur maximale de 4,5 m [18 pieds]

Pour les prises électriques en Europe, choisissez un cordon électrique harmonisé internationalement et marqué "<HAR>",

à 3 conducteurs, d'un diamètre de fil minimum de 0,75 mm2, d'une tension nominale de 300 V, avec une gaine isolée en PVC. Le cordon doit avoir une fiche moulée d'une tension nominale de 250 V et d'une intensité nominale de 10 A.

21.


<40 lbs
<18 kgs
40 - 70 lbs
18 - 32 kgs
70 - 121 lbs
32 - 55 kgs
>121 lbs
>55 kgs

Appendix H: Installation - Sicherheitshinweise (German)

1. Installationsanleitungen

Lesen Sie alle Installationsanleitungen, bevor Sie das Gerät an die Stromversorgung anschließen.

2. Übertemperatur

Dieses Gerät sollte nicht in einem Bereich mit einer Umgebungstemperatur über der maximal empfohlenen Temperatur von 45°C (113°F) betrieben werden. Es ist ein Luftstrom von 200 LFM bei maximaler Umgebungstemperatur erforderlich. Außerdem sollten mindestens 8 cm (3 in.) Freiraum um die Belüftungsöffnungen sein, um einen einwandfreien Luftstrom zu gewährleisten.

3. Stapeln des Chassis

Das Chassis sollte nicht auf andere Geräte gestapelt werden. Wenn das Chassis herunterfällt, kann es zu Verletzungen und Beschädigungen an Geräten führen.

4. Redundanter Stromversorgungsanschluss - Elektrische Gefahr

Dieses Produkt verfügt über eine Abdeckung über dem Bereich für die redundante Stromversorgung. Betreiben Sie das Produkt nicht, wenn diese Abdeckung nicht sicher festsitzt oder entfernt wurde.

5. Bei Gewitter - Elektrische Gefahr

Arbeiten Sie während eines Gewitters und Blitzschlag nicht am Gerät, schließen Sie keine Kabel an oder ab.

6. Anschließen/Trennen von InfiniBand-Kupferkabel

InfiniBand-Kupferkabel sind schwer und nicht flexible. Deshalb müssen sie vorsichtig an die Anschlüsse angebracht bzw. davon getrennt werden. Lesen Sie die speziellen Warnungen und Anleitungen des Kabelherstellers.

7. Gafahr des elektrischen Schocks.

Gafahr des elektrischen Schocks. Entferrnen des Netzsteckers elnes Netzteils spannungsfrei. Um alle Einhieten spannungsfrei zu machen sind die Netzstecker aller Netzteile zu entfernen

Risk of electric shock and energy hazard.
The PSUs are all independent.
Disconnect all power supplies to ensure a powered down state inside of the switch platform.

8. Rack-Montage und Wartung

Wenn dieses Produkt in einem Rack montiert oder gewartet wird, sind besondere Vorsichtsmaßnahmen zu ergreifen, um die Stabilität des Systems zu gewährleisten. Im Allgemeinen sollten Sie das Gestell von unten nach oben mit Geräten füllen.

9. Geräteinstallation

Diese Gerät sollte nur von geschultem und qualifiziertem Personal installiert, ausgetauscht oder gewartet werden.

10. Geräteentsorgung

Die Entsorgung dieses Geräts sollte unter Beachtung aller nationalen Gesetze Bestimmungen erfolgen.

11. Regionale und nationale elektrische Bestimmungen

Dieses Gerät sollte unter Beachtung der regionalen und nationalen elektrischen Bestimmungen installiert werden.

12. Richtigen Schutz sicherstellen

Geeigneter elekrischer, mechanischer und Feuerschutz sind vom
Hersteller des Endprodukts oder dem Endbenutzer bereitzustellen.

13. Strahlenkontakt

Achtung – Nutzung von Steuerungen oder Einstellungen oder Ausführung von Prozeduren, die hier nicht spezifiziert sind, kann zu gefährlichem Strahlenkontakt führen..

Klasse 1 Laserprodukt und Referenzen zu den aktuellsten Lasterstandards :
ICE 60 825-1:1993 + A1:1997 + A2:2001 und EN 60825-1:1994+A1:1996+ A2:2001

14. UL-und CSA Certified Netzkabel

Für Nordamerika Stromanschluss, wählen Sie ein Netzkabel, das UL-und CSA Certified
3 - Leiter, [18 AWG], mit einem angespritztem Stecker bewertet bei 125 V, [15], mit einer Mindestlänge von 1,5 m [Six Feet] aber nicht mehr als 4,5 m.
Für die europäischen Zusammenhang, wählen Sie ein Netzkabel, das international harmonisiert und der Aufschrift "<HAR>",
3 - Leiter, mindestens 0,75 mm2 Draht, bewertet mit 300 V, mit einem PVC-Mantel isoliert. Das Kabel muss eine angespritztem Stecker bewertet bei 250 V, 10 A. "

15. Ableitstrom> 3.5mA LEAKAGE >3.5mA

WARNUNG: Hohe Ableitstrom; Earth Verbindung, bevor Sie die Verbindung von wesentlicher Bedeutung werden.

16. Add GND Verbindung Informationen

Bevor Sie dieses Gerät an das Stromnetz, die Schutzerde Terminal Schrauben dieses Gerät muss an den Schutzleiter in der Gebäudeinstallation.

17. Installation Codes

Dieses Gerät muss installiert sein, entsprechend auf die neueste Version des Landes National Electrical Code. Für Nordamerika, müssen in Übereinstimmung mit den geltenden Vorschriften in der US-amerikanischen National Electrical Code und dem Canadian Electrical Code.

18. Zusammenschaltung von EINHEITEN

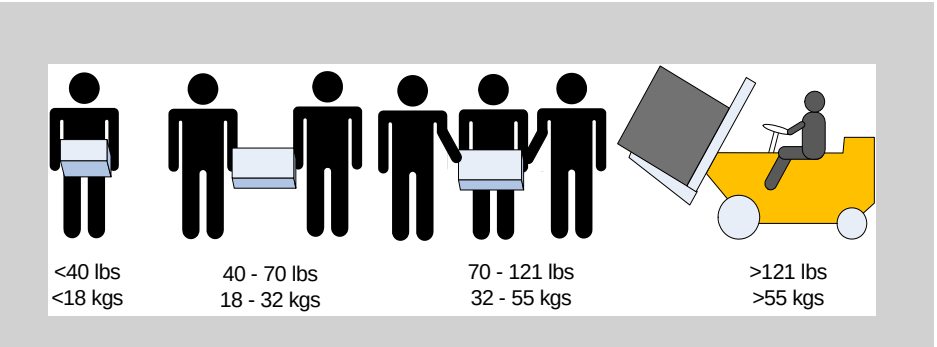
Kabel für den Anschluss an das Gerät RS232-und Ethernet-Schnittstellen müssen UL zertifiziert Typ DP-1 oder DP-2. (Hinweis-, wenn nicht mit Wohnsitz in LPS-Schaltung)

Überstromschutz: Eine leicht zugängliche Auflistung Abzweigleitung Überstrom-Schutzeinrichtung 20 A bewertet werden müssen in dem Gebäude Verkabelung.

19. Zweipolige bzw. Neutralleiter-Sicherung im Netzteil

Achtung:
Zweipolige bzw. Neutralleiter-Sicherung im Netzteil. Netzstecker ziehen, um sicherzustellen, daß keine Spannung am Gerät anliegt. Entfernen Sie alle Netzkabel vor dem Öffnen der Abdeckung dieses Produkts oder dem Berühren der Innenteile.

20.

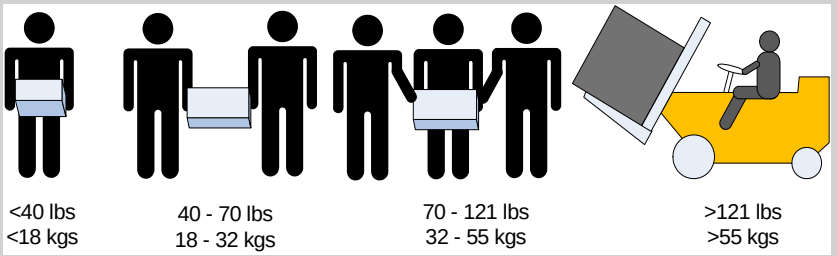

<40 lbs
<18 kgs
40 - 70 lbs
18 - 32 kgs
70 - 121 lbs
32 - 55 kgs
>121 lbs
>55 kgs

Appendix I: Advertencias de seguridad para la instalación (Spanish)

1. Instrucciones de instalación

Antes de conectar el equipo a la fuente de alimentación, leer todas las instrucciones de instalación.

2. Lesión corporal por peso



3. Lesión corporal por peso

This equipment is very heavy and should be moved using a mechanical lift to avoid injuries.

4. Sobrecalentamiento

No se debe utilizar el equipo en un área con una temperatura ambiente superior a la máxima recomendada: 45°C. Además, para garantizar una circulación de aire adecuada, se debe dejar como mínimo un espacio de 8 cm (3 pulgadas) alrededor de las aberturas de ventilación.

5. Apilamiento del chasis

Los chasis no se deben apilar sobre otros equipos. La caída del chasis podría causar lesiones corporales, así como daños al equipo.

6. Dos fusibles, uno en el polo y otro en el neutro

Dos fusibles, uno en el polo y otro en el neutro. Quitar los cables de corriente antes de abrir la tapa de este producto o tocar cualquier componente interno.

7. Cuando hay rayos: peligro de descarga eléctrica

No utilizar el equipo ni conectar o desconectar cables durante períodos de actividad de rayos.

8. Conexión y desconexión del cable Copper InfiniBand

Dado que los cables de cobre InfiniBand son pesados y no son flexibles, su conexión a los conectores y su desconexión se deben efectuar con mucho cuidado. Para ver advertencias o instrucciones especiales, consultar al fabricante del cable.

9. Montaje y mantenimiento de bastidores

Al instalar o realizar el mantenimiento de este aparato en un bastidor, es preciso adoptar precauciones especiales para garantizar que el sistema se mantenga estable. En general, en un bastidor, los equipos se deben instalar comenzando desde abajo hacia arriba.

10. Instalación de equipos

La instalación, el reemplazo y el mantenimiento de este equipo estarán a cargo únicamente de personal capacitado y competente.

11. Asegurar confinamientos adecuados

El fabricante del producto final o el usuario final deberán suministrar
un confinamiento adecuado para componentes eléctricos y mecánicos y contra incendio.

12. Eliminación de equipos

La eliminación definitiva de este equipo se debe efectuar conforme a todas las leyes y reglamentaciones nacionales.

13. Códigos eléctricos locales y nacionales

Este equipo se debe instalar conforme a los códigos eléctricos locales y nacionales.

14. Cable de alimentación homologado por UL y con certificación CSA

En conexiones de América del Norte, seleccionar un cable de alimentación homologado por UL y con certificación CSA de tres conductores, [16 AWG], terminado en un enchufe moldeado con capuchón de 125 voltios nominal, [13 A], con una longitud mínima de 1,5 metros, pero no más de 4,5 metros.

En conexiones europeas, seleccionar un cable de alimentación armonizado internacionalmente y marcado "<HAR>", de tres conductores, hilo de 1,0 mm2 como mínimo, 300 voltios nominal, con cobertura protectora aislante de PVC. El cable debe tener un enchufe moldeado con capuchón de 250 voltios nominal, 10 A.

15. Añadir conexión a tierra

Antes de conectar el dispositivo a la línea de alimentación, los tornillos del terminal de la puesta a tierra de protección del dispositivo se deben conectar a la puesta a tierra de protección de la instalación del edificio.

(Información de conexión a tierra):

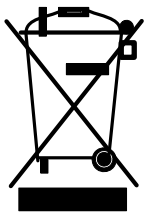
La instalación del edificio deberá prover un medio para la conexión con la puesta a tierra de protección y un técnico de servicio deberá conectar permanentemente el equipo a dicho medio de conexión.

Un TÉCNICO DE SERVICIO comprobará si la toma eléctrica de la que se suministrará corriente al equipo provee una conexión con la puesta a tierra de protección del edificio. De no ser así, el TÉCNICO DE SERVICIO se encargará de instalar un CONDUCTOR DE CONEXIÓN A TIERRA DE PROTECCIÓN, del terminal de puesta a tierra de protección separado al conductor de tierra de protección del edificio. El equipo se instalará en un área donde haya conexión equipotencial, como por ejemplo, un centro de telecomunicaciones o una sala de computadoras dedicada.

16. Códigos de instalación

Este dispositivo se debe instalar conforme a la versión más reciente de los códigos eléctricos nacionales del país en cuestión. En América del Norte, el equipo se debe instalar de acuerdo con las disposiciones vigentes del Código Eléctrico Nacional de los EE.UU. y del Código Eléctrico de Canadá.

17. Directiva sobre RAEE



Conforme a la Directiva 2002/96/CE sobre RAEE, todos los residuos de equipos eléctricos y electrónicos (EEE) se deben recolectar por separado y no se deben eliminar junto con residuos domésticos.

Al deshacerse de este producto y de todas sus partes, hágalo de una manera responsable y respetuosa con el medio ambiente.